U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE

June 9, 2017

TO: Members, Subcommittee on Digital Commerce and Consumer Protection

FROM: Committee Majority Staff

RE: Hearing entitled "Disrupter Series: Update on IOT Opportunities and Challenges."

I. INTRODUCTION

The Subcommittee on Digital Commerce and Consumer Protection will hold a hearing on Tuesday, June 13, 2017, at 10:30 a.m. in 2123 Rayburn House Office Building. The hearing is entitled "Disrupter Series: Update on IOT Opportunities and Challenges."

II. WITNESSES

- William S. Marras, Ph.D., Executive Director and Scientific Director of the Spine Research Institute, The Ohio State University;
- Gary D. Butler, Ph.D., Founder, Chairman and CEO, Camgian Microsystems Corporation;
- Mark Bachman, Ph.D., CTO and Co-Founder, Integra Devices;
- Peter B. Kosak, Executive Director, Urban Active Solutions, General Motors North America;
- Cameron Javdani, Director of Sales and Marketing, Louroe Electronics; and
- Bill Kuhns, President, Vermont Energy Control Systems LLC.

III. BACKGROUND

A. Overview: Internet of Things

The Internet of Things (IoT) generally refers to a growing network in which connected devices, services, and objects collect and exchange data.[1] These "smart devices" are equipped with microchips, sensors, and wireless communication capabilities and are being used to optimize everything from manufacturing and home appliances to healthcare and automobiles. Connected devices offer businesses and consumers a variety of benefits. Benefits for consumers include responsive services, shorter feedback loops, convenience, enhanced experiences, and many more.[2]

[1] http://www.businessinsider.com/internet-of-things-devices-applications-examples-2016-8
[2] https://www.mediapost.com/publications/article/273797/10-consumer-benefits-from-the-internet-of-things.html

As for businesses, IoT innovations have driven efficiency, productivity, real-time, accurate information, and much more. The Internet of Things is revolutionizing a variety of industries and, as IoT applications increasingly become more prevalent, having a substantial impact on major U.S. economic sectors including manufacturing, healthcare, and automotive.

For example, by 2025, IoT is projected to create $1.1 trillion to $2.5 trillion in value annually in the health sector;[3] $.9 trillion to $2.3 trillion in value annually in manufacturing;[4] and $100 billion to $300 billion in value annually in urban infrastructure.[5] Further, analysts are predicting that by 2020, annual revenues for IoT vendors selling hardware, software, and other IoT solutions may exceed $470 billion[6] and that by 2025, the IoT market will grow from an installed base of 15.4 billion devices in 2015 to 75.4 billion, marking a remarkable 489 percent increase.[7] Such an increase is expected to result in the IoT market size increasing from $900 million in 2015 to a total economic impact of approximately $2.7 to $6.2 trillion in 2025.[8] Additionally, as devices increasingly become connected and companies explore IoT-based solutions, developers contributing to IoT will be needed. Notably, this market is projected to create 4.5 million developer jobs by 2020.[9] Clearly, with so many connected devices, the tech-based applications are endless and, with such significant economic output, the benefits consumers will experience are substantial.

B. Internet of Things Applications

The Internet of Things has already made its mark on several industries and continues to broaden its impact across new industries as more devices are being connected. To date, industries seeing extensive IoT applications include healthcare, wearable technology, manufacturing, and infrastructure. The healthcare industry is beginning to see the Internet of Things impact providers as well as patients.[10] For example, "[u]ltrasounds, thermometers, glucose monitors, electrocardiograms," and more are all increasingly becoming connected.[11] Connected medical devices allow patients to better track their health, especially in situations where follow-up appointments are crucial.[12] Additionally, some hospitals have started to utilize "smart beds." Incredibly, these "smart beds" are able to adjust themselves so as to provide a patient with the correct angle and pressure to provide proper support without the need for nurse intervention.[13]

Wearable technology integrates networked devices into portable accessories like watches, jewelry, clothes, and glasses. These devices collect data, track activities, and customize the

[3] https://www.mercatus.org/publication/projecting-growth-and-economic-impact-internet-things
[4] *Id.*
[5] *Id.*
[6] http://www.dyogram.com/2017/04/internet-of-things-iot-market-potential-trends-in-2017-and-beyond/
[7] *Id.*
[8] *Id.*
[9] http://www.techrepublic.com/article/why-10-million-developers-are-lining-up-for-the-internet-of-things/
[10] http://www.businessinsider.com/internet-of-things-in-healthcare-2016-8
[11] *Id.*
[12] *Id.*
[13] *Id.*

consumer experience.[14] Common examples of these devices are fitness trackers such as Fitbit, Garmin, Apple Watch, and Jawbone. These devices allow consumers to record their exercise and health statistics and receive feedback on progress toward health goals.[15] More and more consumers are turning to wearable technology, and this trend is reflected by the growth of the market. Last year, the wearable market reached $14 billion and is expected to grow to 162.9 million units by 2020.[16]

Smart manufacturing is the use of connected devices to improve the efficiency and productivity of manufacturing operations.[17] This typically has involved some aspect of retrofitting existing manufacturing equipment with sensors to facilitate the connectivity necessary to achieve efficiency and productivity goals. However, new manufacturing equipment now comes with pre-installed IoT sensors.[18] The Internet of Things is helping manufacturing companies better manage their workforce, seek new business opportunities, and drive out costly inefficiencies. The importance of connected devices to manufacturing is seen in the increased focus on integrating connected devices to manufacturing operations. Specifically, it is projected that the installed base of manufacturing IoT devices will increase to 923 million in 2020 with manufacturers spending almost $267 billion.[19]

In addition to smart manufacturing, communities are beginning to integrate IoT devices with infrastructure as well as architecture. Examples of where smart architecture is being implemented include lighting and elevators. Building managers are beginning to implement lightbulbs and light fixtures that save money and energy. Further, smart elevators are increasing convenience and efficiency for passengers. Passengers first select the floor they want and then they are directed to the elevator that will take them to their floor with the fewest number of stops.[20] This not only benefits the user, but also the building owner. Because smart elevators make fewer stops, they use less energy and, as a result, increase efficiency.

Communities are also increasingly integrating advanced technology into infrastructure. Doing so allows communities to "measure and monitor traffic management, waste and water services, and even police services to lower costs and improve services for citizens."[21] Smart streetlights, which are being installed throughout various communities, offer a variety of benefits ranging from reduction in energy output and notice of maintenance needs to improve traffic circulation and even detect gunshots. AT&T recently partnered with GE to install its "Current CityIQ sensors" into street lights, which will monitor traffic circulation, parking spots, air quality, weather emergencies, and much more.[22] Further, IoT can be used by communities to improve water supply efficiency. "Smart meters" can "improve leak detection and data accuracy, prevent lost revenue due to inefficiency and boost productivity by reducing the amount of time spent

[14] https://www.mercatus.org/publication/projecting-growth-and-economic-impact-internet-things
[15] http://www.businessinsider.com/wearable-technology-iot-devices-2016-8
[16] *Id.*
[17] http://www.businessinsider.com/internet-of-things-in-manufacturing-2016-10
[18] *Id.*
[19] *Id.*
[20] https://sourceable.net/smart-elevators-and-the-internet-of-things/
[21] https://www.mercatus.org/publication/projecting-growth-and-economic-impact-internet-things
[22] https://www.engadget.com/2017/02/27/atandts-smart-streetlights-can-smooth-traffic-detect-gunshots/

entering and analyzing data."[23] Cars connected to each other and to infrastructure can communicate directly and save lives. Moreover, IoT will likely disrupt traditional public transportation from the implementation of automated vehicle fleets to providing transit authorities with real-time data to allow for timely contingency plans, which will ensure residents have access to safe, reliable, and efficient public transportation.[24]

C. Federal Trade Commission

The Federal Trade Commission (FTC) has jurisdiction over IoT-related privacy and security concerns and is focusing its efforts to ensure consumer protection. The FTC has set forth "best practices" recommendations to IoT companies and industries using connected devices that focus on consumer protection. Such recommendations include building security into the IoT device at the outset, training employees about the importance of security, considering measures to keep unauthorized users from accessing consumer devices, data, or other personal information, and providing security patches throughout the life cycle of IoT devices when necessary.[25]

The FTC's focus on consumer privacy in the IoT space led to an action against D-Link that was filed in January of this year.[26] The action alleges that "inadequate security measures taken by the company left its wireless routers and Internet cameras vulnerable to hackers and put U.S. consumers' privacy at risk."[27] Further, the FTC claims that "D-Link failed to take reasonable steps to secure its routers and Internet Protocol (IP) cameras, potentially compromising sensitive consumer information, including live video and audio feeds from D-Link IP cameras."[28] The D-Link action is part of the FTC's efforts to "protect consumers' privacy and security in the Internet of Things (IoT), which includes cases the agency has brought against ASUS and TRENDnet."[29]

Additionally, the same month the FTC filed the D-Link action, the FTC announced a challenge to the public to "create an innovative tool that will help protect consumers from security vulnerabilities in the software of home devices connected to the Internet of Things."[30] The "IoT Home Inspector Challenge" asks contestants to develop a tool that would address security vulnerabilities caused by out-of-date software in IoT devices.[31] Such a tool might be "a physical device that the consumer can add to his or her home network that would check and install updates for other IoT devices" or it might be "an app or cloud-based service" providing security protection.[32] Submissions were accepted through May 2017 and winners of the challenge will be announced in July.

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[23] http://internet-of-things-innovation.com/insights/the-blog/iot-applications-smart-cities/#.WTiMrozyvcs
[24] *Id.*
[25] https://www.ftc.gov/news-events/press-releases/2015/01/ftc-report-internet-things-urges-companies-adopt-best-practices
[26] https://www.ftc.gov/news-events/press-releases/2017/01/ftc-charges-d-link-put-consumers-privacy-risk-due-inadequate
[27] *Id.*
[28] *Id.*
[29] *Id.*
[30] https://www.ftc.gov/news-events/press-releases/2017/01/ftc-announces-internet-things-challenge-combat-security
[31] *Id.*
[32] *Id.*

IV. ISSUES

The following issues will be examined at the hearing:

- The benefits IoT offers consumers, including responsive services, enhanced experiences, and convenience.
- The benefits IoT offers to companies, including increased productivity and efficiency.
- How industry is responding to cybersecurity and privacy challenges.
- Any obstacles or barriers that may hinder the increased growth of the IoT market.

V. STAFF CONTACTS

If you have any questions regarding this hearing, please contact Bijan Koohmaraie of the Committee Staff at (202) 225-2927.