Testimony of

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Chairman Thune, Ranking Member Nelson, distinguished Members of the Committee, my name is Stanley Pierre-Louis, and I am Senior Vice President and General Counsel of the Entertainment Software Association ("ESA"). Thank you for inviting me to testify today. ESA is dedicated to serving the policy and public affairs needs of companies that publish computer and video games for video game consoles, handheld devices, personal computers and the Internet. Our members employ highly-skilled artists, authors, software programmers, engineers and developers who produce a wide array of highly-expressive, interactive works, which include audiovisual materials, musical compositions, literary works, artistic works and software. Last year alone, the video game industry generated more than $23 billion in revenue in the United States and entertained hundreds of millions of consumers throughout the world. Our members are at the forefront of the ongoing technological revolution in interactive entertainment, and I am honored to be invited to testify today about the exciting developing technologies known as Augmented Reality (or "AR") and Mixed Reality (or "MR").

I. Introduction

AR and MR have some similarities to their better-known cousin, Virtual Reality (or "VR"), but differ in key respects – mainly, how the video graphics and digital content integrate with the physical world around us. With ***Virtual Reality***, the user typically wears a headset or opaque goggles (often accompanied by headphones) and is closed off from the "real world." The user is fully immersed in a software-generated environment (often termed a "virtual world") displayed before her eyes. By contrast, ***Augmented Reality*** involves computer technology that overlays software-generated images, sounds and other information over the "real world." Complementary hardware for AR can include a visor with transparent (or semi-transparent) lenses, a head-mounted display, or a hand-held device, such as a smart phone or video game equipment. *Pokémon GO*,

the mobile game that captured the attention of millions of users worldwide this summer, is one of the best-known examples of AR. That game was released on July 6, 2016, and, within a week, as many as twenty-five million U.S. smartphones had logged in to play the game.[1]

Because AR can be used to overlay data on top of "real world" activities, it is versatile in a variety of contexts. One popular use of AR technology occurs in broadcasts of National Football League games, where a virtual blue line is overlaid across the field to represent the "line of scrimmage" and a virtual yellow line is overlaid across the field to represent the "first down" marker.[2] Earlier uses of this technology were simulated in several scenes of the 1977 epic film *Star Wars: Episode IV – A New Hope*, including when Princess Leia sent a pivotal holographic message to General Obi-Wan Kenobi.[3]

The potential for AR is enormous. Imagine walking through an airport and seeing personalized directions to your gate; watching a city bus approach and knowing immediately whether it is the bus you need or how long you will need to wait for the next bus; walking by a restaurant that prompts a menu to "float" in front of you; or getting turn-by-turn instructions on your windshield while driving.[4]

Mixed Reality contains elements of both VR and AR. Whereas VR immerses you in a simulated world – and whereas AR overlays digital information in real-world settings – MR blends

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[1] *Future Reality: Virtual, Augmented & Mixed Reality (VR, AR, & MR) Primer*, Bank of America Merrill Lynch Thematic Investing, Sept. 7, 2016, at 41 [hereinafter "Bank of America Report"].

[2] Brian D. Wassom, *Augmented Reality Law, Privacy, and Ethics: Law, Society, and Emerging AR Technologies*, at 7 (Allison Bishop ed., Syngress, 2015).

[3] See http://www.starwars.com/video/help-me-obi-wan-kenobi (video of holographic message from Princess Leia).

[4] Ian King and Dana Hull, *The Car Windshield is Turning into a Computer Screen*, Bloomberg (Jan. 22, 2015), https://www.bloomberg.com/news/articles/2015-01-22/the-car-windshield-is-turning-into-a-computer-screen.

3-D digital content into your physical world. Using a transparent lens or goggles, the user can see *both* the real world *and* a virtual world seamlessly tied together. MR differs from AR in that the virtual images and elements overlaid in the user's field of vision can interact with and recognize the user and are spatially aware of the environment. In MR, virtual objects placed in the real world appear real and tangible to the user. The user is allowed to move those objects around, observe their minute details, and even interact with them using gestures or voice commands. Imagine hiking on a nature trail with a virtual companion who cannot only tell you where to go, but teach you about your surroundings.[5] Or, in the video game context, imagine defending against a virtual army of flying robots that have invaded your home through the living room walls.[6] The possibilities of these new technologies are truly limitless.

In many ways, VR, AR and MR are ***evolutionary***: they emerged from advancements in existing technologies, such as microchip processing, software, razor display screens, GPS, 3-D graphics, wearable computers and the mobile Internet. Legal frameworks developed in the context of these related technologies have protected the public interest throughout those advancements.

But, these technologies may also prove to be ***revolutionary***. We may not yet have George Jetson's flying car, but we do have AR and MR. It is no longer science fiction. The public's excitement over the entertainment possibilities of VR, MR and AR may be driving the current wave of innovation and pushing products to market, but we are only beginning to scratch the

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[5] To be sure, several mobile apps already provide hikers with trail directions and information about their surroundings. See http://bevond.com/blog/how-augmented-reality-will-make-you-a-smart-hiker/ (discussing the use of AR in hiking apps); see also http://www.atlasandboots.com/best-hiking-apps/ (listing mobile and AR hiking apps). However, as MR capabilities advance, the technology will become more integrated into the user experience.

[6] See *RoboRaid* video, *available at* https://www.microsoft.com/microsoft-hololens/en-us/apps/roboraid.

surface of what these technologies can achieve. Indeed, the possibilities for the application of these technologies in the fields of education, healthcare, science, business and national defense are bountiful. And, they will become more interactive, more immersive and more accessible and more affordable over time. Goldman Sachs researchers recently estimated that, by 2025, VR and AR will constitute at least a $23 billion market and could even be as much as a $182 billion market.[7]

American technologists and entrepreneurs are leading the way, just as they did at the dawn of the Internet. Our members are at the forefront of this innovation, but they are by no means alone. As with past technological leaps, the government should embrace and empower these emerging technologies by allowing them to iterate, grow and flourish so they can reach their full potential benefit to the American society and economy. I am pleased to be here today to talk about the applications emerging in this field, as well as a few of the ongoing considerations that are at the forefront of this evolution.

II. Current and Predicted Applications of these Emerging Technologies

AR and MR technologies already offer immersive game-playing and entertainment experiences. Some examples include using video game controllers to play air hockey on a virtual field that is projected by the light bars on the controllers (*The Playroom*, Sony PlayStation 4); solving a high-tech crime thriller that uses objects in your physical space to create the crime scene and for hiding clues (*Fragments,* Microsoft HoloLens); and a fighting dragon that pops up from an AR playing card (*Archery*, Nintendo 3DS). However, in addition to providing entertainment, these technologies will likely serve more broadly as platforms for our routine daily tasks. Think

[7] Heather Bellini et al., *Virtual & Augmented Reality: Understanding the Race for the Next Computing Platform*, Goldman Sachs Global Investment Research, Jan. 13, 2016, at 14 [hereinafter "Goldman Sachs Report"].

of the smartphone. This one device, which emanated from the mobile phone, now serves as an email and texting hub, a calendar, a to-do list, a health monitor, a map, a music player, a weather forecaster and a ride-hailing service, to name just a few applications. AR and MR have the potential to fuel the next generation of tools to make our daily lives even more productive and enjoyable and to connect people who might be miles apart. They are poised to dramatically improve many sectors of our society and economy. Here are just a few of the sectors that stand to be dramatically improved by AR and MR.

In the ***Entertainment*** sector, content creators and consumers are teeming with excitement over AR and MR.[8] Video games have already undergone dramatic improvements in user experience, but AR and MR present new possibilities. And, as the recent success of *Pokémon GO* suggests, this evolution can have ancillary societal benefits. For example, unlike traditional video games that were best played from the living room or on PCs, AR and MR experiences can be suited to a variety of locations, both indoors and out. *Pokémon GO* motivates users to explore the real world around them: to go outdoors and be active. This new and promising evolution of games integrates learning, exploration and physical activity like never before.

For video entertainment, AR and MR will be used by artists to imagine and bring new worlds to life and to augment our existing worlds in ways that once seemed impossible. Peter Jackson, the Oscar-winning director of the *Lord of the Rings* series, serves on the advisory panel for Magic Leap, one of ESA's member companies that is at the forefront of developing MR

[8] John Gaudiosi, *Why Gamers are Excited about Virtual Reality and Augmented Reality*, Fortune (Sept. 11, 2015), http://fortune.com/2015/09/11/gamers-are-excited-about-vr-ar/ ("Gamers are always looking to the next thing, whether it is the next game in a franchise or the next hardware platform/capability.").

technology. Jackson recently told *Wired* magazine, "[t]his mixed reality is not an extension of 3-D movies. It's something completely different…. Once you can create the illusion of solid objects anywhere you want, you create new entertainment opportunities."[9]

Indeed, Magic Leap's MR technology is nothing short of amazing; it creates "mixed-reality objects" that "are aware of their environment."[10] Advanced hardware "constantly gathers information, scanning the room for obstacles, listening for voices, tracking eye movements and watching hands."[11]

Healthcare. AR and MR may prove transformative to the healthcare industry. Already today, AR is being used to address the pain management and rehabilitation needs of pediatric burn victims.[12] In the future, one could imagine a surgeon wearing AR or MR glasses to review a patient's MRI scan results while the scan is overlaid on top of the patient. There may be therapeutic uses as well; patients experiencing pain could be transported to relaxing destinations. Some researchers are even testing the ability of VR to help paraplegics learn to walk again.[13] And still other researchers are examining whether these technologies can help treat patients with

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[9] Kevin Kelly, *The Untold Story of Magic Leap, the World's Most Secretive Startup*, Wired (April 2016), https://www.wired.com/2016/04/magic-leap-vr/.

[10] David M. Ewalt, *Inside Magic Leap, The Secretive $4.5 Billion Startup Changing Computing Forever*, Forbes (Nov. 2, 2016), http://www.forbes.com/sites/davidewalt/2016/11/02/inside-magic-leap-the-secretive-4-5-billion-startup-changing-computing-forever/#491fca29e83f.

[11] *Id.*

[12] Jonathan Mott, et al., *The Efficacy of an Augmented Virtual Reality System to Alleviate Pain in Children Undergoing Burns Dressing Changes: A Randomised Controlled Trial*, Burns Journal (September 2008), http://www.burnsjournal.com/article/S0305-4179(07)00286-0/abstract; Monika Joshi, *Pokémon Go Helps Harborview Patients Heal*, America's Essential Hospitals (Aug. 11, 2016), https://essentialhospitals.org/pokemon-go-helps-patients-heal/.

[13] Ananya Bhattacharya, *Paraplegics are Learning to Walk Again with Virtual Reality*, Quartz (Aug. 15, 2016), http://qz.com/757516/paraplegics-are-learning-to-walk-again-with-virtual-reality/.

phobias or PTSD, as "virtual worlds can create artificial, controlled stimuli in order to habituate the patient to those environments that cause anxiety."[14]

Education. The applications of these technologies to education are endless. For example, Microsoft has worked with Case Western Reserve University to use the HoloLens for medical student training; medical students can view and interact with a holographic human body with animated skeletal structure and circulatory system, replacing the need for cadavers.[15] Microsoft is also working with the educational publisher Pearson to use the HoloLens to create a number of learning tools, including online tutoring and coaching in areas as disparate as nursing, engineering and construction.[16]

Today, users can download iPhone apps that identify stars, constellations and satellites when users direct their iPhones to the night sky.[17] However, one can also imagine a class learning about the Civil War and seeing a three-dimensional representation of Abraham Lincoln standing before the students, delivering the Gettysburg Address. And, one can imagine students being virtually transported to the Colosseum in Rome during the Flavian dynasty to experience life as a gladiator. According to a professor of education the University of Pennsylvania's Graduate School

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[14] Goldman Sachs Report at 24.

[15] Kathryn Jeffords, *Virtual and Augmented Reality: Changing the Game in Healthcare*, Science Media Awards Summit in the Hub (June 29, 2016), http://www.sciencemediasummit.org/blog/virtual-and-augmented-reality-changing-the-game-in-healthcare.

[16] Mark Coppock, *Microsoft and Pearson are partnering to Turn HoloLens into an Educational Tool*, Digital Trends (Oct. 26, 2016), http://www.digitaltrends.com/computing/pearson-hololens-mixed-reality-education/.

[17] Ci, *5 Superb Augmented Reality Astronomy Apps for iPhone*, iPhoneness (June 17, 2016), http://www.iphoneness.com/iphone-apps/augmented-reality-astronomy-apps/.

of Education, "[r]esearch shows that interacting with AR alone improves students' understanding of a concept."[18]

In addition, high-risk professionals would be able to receive realistic, hands-on training in a safe environment. AR and MR technology will enabling users to tour a new city and immediately learn background information about monuments or architecturally significant buildings simply by looking at them. And, one day, we might really know what it is like to stand in another's shoes, walking through simulations designed to help us understand each other better to help foster empathy.[19]

Business and Engineering. As previously mentioned, Microsoft is already selling its MR visor, called HoloLens, to developers. A user of the HoloLens will be able to watch "a live football game on a virtual screen 'hovering' next to a web browser window, alongside a few other virtual screens."[20] These "hovering" screens could eventually replace the various physical screens we use today at home and at the office because they can be summoned into (and out of) your field of vision and pinned to the walls and counters of your physical space as requested while using AR and MR glasses. The mix of entertainment, information and work applications has the potential to improve every workspace in America.

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[18] Susan A. Yoon, *The Educator's Playbook: The Role of Augmented Reality in a Lesson Plan*, Penn GSE Newsroom (2016), http://www.gse.upenn.edu/news/educators-playbook/role-augmented-reality-lesson-plan.

[19] Nick Harley, *How Augmented Reality and Empathetic Storytelling is Changing Audience Engagement*, PR Newswire for Journalists (Aug. 31, 2016), https://mediablog.prnewswire.com/2016/08/31/how-augmented-reality-and-empathetic-storytelling-is-changing-audience-engagement/.

[20] Kelly, *supra* note 9.

The applications for architects, builders, designers, artists and engineers will be nothing short of transformative. Instead of looking at a two-dimensional computer screen rendering a space in 3-D, users will be able to stand in the space as they create it before a single brick is laid. In fact, Lockheed Martin has collaborated on AR projects to speed up the maintenance process for F-22 and F-35 fighter jets: "When an engineer looks at the aircraft using the smart glasses, they see digitally displayed plans projected over the physical plane. They can then use a tablet to enter any damage or defects."[21]

This technology also enhances the ability of consumers to become more mobile. Have a new job in St. Louis or in Tampa? Instead of incurring the expense of flying to look for a new home, take a virtual tour of homes from right where you are.[22] Similarly, vacationers are now able to explore possible destinations before committing to a locale or a hotel.[23]

National Defense. The United States military already uses VR to train military personnel, including flight and combat simulations.[24] As this technology helps create more realistic, immersive simulations, this aspect of military training will become increasingly useful and effective. It is also not hard to imagine the value of AR or MR glasses on the battlefield, where vital information could be placed strategically in the user's field of vision, accessible without the

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[21] See *Augmented Reality and Workplace Training*, SpongeUK (June 19, 2015), http://spongeuk.com/2015/06/augmented-reality-and-workplace-training/.

[22] See https://www.vrglobal.com/real-estate/ (solutions for virtual tours using VR and AR technologies).

[23] See http://www.augment.com/blog/augmented-reality-in-tourism/, (discussing use of AR technology in tourism).

[24] Goldman Sachs Report at 26.

user having to resort to looking down at a screen or map. Indeed, so-called "heads-up" displays are now commonplace in our military's advanced fighter jets.[25]

III. Legal Landscape

As technologies have emerged over time, laws have developed and evolved to ensure Americans' privacy and data security. Our federal laws and regulations have proven to be sufficiently robust to protect consumer interests, while remaining flexible enough to allow industries to innovate and deliver products and services to customers specified to their needs. Moreover, in each state and territory, there is no shortage of statutory and common laws governing negligence, trespass, privacy, data protection and product liability.

ESA's members are committed to meaningful privacy and data security protections and to providing the tools consumers need to make informed decisions about the products they plan to purchase. Our industry has embraced a culture of self-regulation and "informed consent." To that end, our industry has long adopted practices that go well beyond what is required by law to inform consumers about our products and privacy practices. In 1994, for example, our industry created the Entertainment Software Rating Board ("ESRB"), a non-profit, self-regulatory body that assigns ratings for video games and apps so parents can make informed choices. The ESRB rating system encompasses guidance about age-appropriateness, content, and interactive elements.[26] This program has been lauded by the Federal Trade Commission ("FTC") for our industry's compliance with the program as well as for providing conspicuous, straightforward and informative disclosures

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[25] See Sean Gallagher, *"Magic Helmet" for F-35 ready for delivery*, Ars Technica (July 24, 2014), http://arstechnica.com/information-technology/2014/07/magic-helmet-for-f-35-ready-for-delivery/.

[26] In 2015, ESRB expanded the use of its ratings to mobile and digital storefronts as part of the International Age Rating Coalition ("IARC"). Information on IARC available at: https://www.globalratings.com/.

to consumers.[27] More importantly, this program has served its ultimate purpose, as our consumers are highly aware of the ratings of the products we sell.[28]

Since 1999, the ESRB has also operated the *Privacy Certified* program (formerly the *ESRB Privacy Online* program), which provides online privacy solutions to address the growing complexity of privacy protection laws. Among other things, the *Privacy Certified* program enjoys "safe harbor" status, which shields program members from potential sanctions or fines from the FTC and/or state attorneys general when violations of the Children's Online Privacy Protection Act (or similar state legislation) arise.[29]

When it comes to balancing children's welfare, parental responsibility and the freedom of speech and expression, AR and MR technologies fit neatly within existing legal frameworks. After all, AR and MR are, at their core, advanced content delivery systems. Just five years ago, the U.S. Supreme Court recognized in *Brown v. Entertainment Merchants Association* that video games are expressive works that enjoy the same First Amendment protections as "books, plays, and movies."[30] As the late Justice Antonin Scalia aptly explained in his majority opinion, "whatever the challenges of applying the Constitution to ever-advancing technology, 'the basic principles of freedom of speech and the press, like the First Amendment's command, do not vary' when a new

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[27] See *FTC Undercover Shopper Survey on Entertainment Ratings Enforcement Finds Compliance Highest Among Video Game Sellers and Movie Theaters*, FTC (March 25, 2013), https://www.ftc.gov/news-events/press-releases/2013/03/ftc-undercover-shopper-survey-entertainment-ratings-enforcement.

[28] See *ESRB Survey: Parental Awareness and Use*, https://www.esrb.org/about/awareness.aspx ("86% of parents are aware of the ESRB rating system").

[29] For more information on the ESRB *Privacy Certified* program, see https://www.esrb.org/privacy/faq.aspx#2.

[30] 564 U.S. 786, 790 (2011).

and different medium for communication appears."[31] The Court rejected the argument that "video games present special problems because they are 'interactive,'" noting that "interactivity" has always been a feature – and a goal – of expressive works: "the better it is, the more interactive."[32] The Supreme Court left little doubt that our foundational laws governing speech are well-equipped to address emerging technologies like AR and MR.

History is instructive on other examples of the law's adaptability to new technologies. In the late 1990s, during the still-early days of the World Wide Web, the FTC believed that many Internet sites did not provide consumers with adequate disclosures.[33] The FTC responded by developing guidance (known as the "Dot Com Disclosures") to help businesses apply established principles of "clear and conspicuous" disclosure to the online context. It has since updated that guidance several times as the Internet has evolved.[34] All of this has occurred within existing FTC authority and without the need to amend the FTC Act.[35]

We encourage the Committee to give AR and MR the space they need to grow, and to avoid any redundant and unnecessary regulation that would have a chilling effect on this nascent and promising industry.

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[31] *Id.*

[32] *Id*. at 798 (internal quotation marks omitted).

[33] See *FTC Staff Issues Guidelines on Internet Advertising* (May 3, 2000), https://www.ftc.gov/news-events/press-releases/2000/05/ftc-staff-issues-guidelines-internet-advertising.

[34] See *FTC Staff Revises Online Advertising Disclosure Guidelines* (March 12, 2013), https://www.ftc.gov/news-events/press-releases/2013/03/ftc-staff-revises-online-advertising-disclosure-guidelines.

[35] See *.com Disclosures: How to Make Effective Disclosures in Digital Advertising*, FTC (March 2013) at p. 2, https://www.ftc.gov/system/files/documents/plain-language/bus41-dot-com-disclosures-information-about-online-advertising.pdf ("The FTC Act's prohibition on 'unfair or deceptive acts or practices' broadly covers advertising claims, marketing and promotional activities, and sale practices in general. The Act is not limited to any particular medium.").

IV. Conclusion

Thank you again for the opportunity to testify today about the thrilling new technological developments under way. These are exciting times for creators, developers, consumers and our country as a whole. AR and MR have tremendous potential beyond entertainment. We should encourage continued American innovation and investment in these areas. And when issues arise, we should look first to existing legal frameworks that have served consumers well in the past. We look forward to working with the Committee and answering any questions you might have.