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4 THE INTERNET OF THINGS: EXPLORING THE NEXT TECHNOLOGY

5 FRONTIER

6 TUESDAY, MARCH 24, 2015

7 House of Representatives,

8 Subcommittee on Commerce, Manufacturing, and Trade

9 Committee on Energy and Commerce

10 Washington, D.C.

11 The Subcommittee met, pursuant to call, at 11:02 a.m.,

12 in Room 2123 of the Rayburn House Office Building, Hon.

13 Michael Burgess [Chairman of the Subcommittee] presiding.

14 Members present: Representatives Burgess, Lance,

15 Blackburn, Harper, Guthrie, Olson, Kinzinger, Brooks, Mullin,

16 Schakowsky, Cardenas, Butterfield, and Pallone (ex officio).

17 Staff present: Charlotte Baker, Deputy Communications

18 Director; James Decker, Policy Coordinator, Commerce,

19 Manufacturing, and Trade; Graham Dufault, Counsel, Commerce,
20 Manufacturing, and Trade; Kirby Howard, Legislative Clerk;
21 Paul Nagle, Chief Counsel, Commerce, Manufacturing, and
22 Trade; Olivia Trusty, Professional Staff, Commerce,
23 Manufacturing, and Trade; Michelle Ash, Democratic Chief
24 Counsel, Commerce, Manufacturing, and Trade; Christine
25 Brennan, Democratic Press Secretary; Jeff Carroll, Democratic
26 Staff Director; and Brendan Hennessey, Democratic Policy and
27 Research Advisor.

|

28 Mr. {Burgess.} The Subcommittee on Commerce,
29 Manufacturing, and Trade will now come to order. The chair
30 now recognizes himself for 5 minutes for the purposes of an
31 opening statement. And again, I want to say good morning to
32 everyone in the hearing room today and especially to our
33 panel of witnesses as we begin to explore the emerging market
34 in our digital ecosystem, the Internet of Things.

35 The Internet of Things marks a crucial juncture for the
36 U.S. economy and for American consumers as our country looks
37 for new economic engines and new sources for jobs. It
38 promises a world in which digital and physical elements
39 connect, gather information real-time, predict circumstances,
40 prevent problems, and create opportunities.

41 This morning some of us attended the Subcommittee's
42 Internet of Things showcase. We saw first-hand some of the
43 innovative ways that companies are using the Internet and
44 networked sensors to create, enhance, and customize products
45 to better meet consumer preference. I thank all of the
46 companies who participated in this morning's event.

47 The products and services displayed at the showcase
48 represent how, in just a very short period of time, increased
49 Internet connectivity, capability have led to the creation of
50 a vast ecosystem in which machines, devices, appliances, and

51 a whole host of other things are able to connect to the
52 Internet.

53 We may be most familiar with this concept in the context
54 of a connected refrigerator that lets us know what we need to
55 purchase on our next trip to the grocery store or a smart
56 watch that informs us when we have reached 10,000 steps or
57 met our caloric intake for the day or a video monitor in our
58 homes that can be watched remotely when traveling for work or
59 vacation. These types of ground-breaking technologies, among
60 many others, are providing valuable conveniences and
61 invaluable information to users.

62 And yet this is just the beginning. Much of the
63 excitement surrounding the Internet of Things lies in its
64 immeasurable scope and potential to touch everything, to
65 touch everyone, and every sector of the economy. We are
66 already seeing the fulfillment of this promise as this
67 technology expands to other areas and captures more than just
68 objects and things.

69 Internet connectivity is being integrated into
70 industrial processes, transportation routes, workforce
71 practices, buildings, and other operational systems and
72 entities across several different industries and
73 environments. This is improving, this is revolutionizing the
74 efficiency, productivity, and effectiveness of the way that

75 individuals, businesses, and governments are conducting
76 various tasks and responsibilities. The Internet of Things,
77 or the Internet of Everything, is fundamentally transforming
78 the way we operate and participate in today's world.

79 The market is still very young. The potential for
80 growth and innovation is at this point virtually limitless.
81 As a physician, I see this potential first hand in the
82 healthcare space. Medical professionals are able to interact
83 with patients in revolutionary ways through connected
84 devices, really devices that no one could have imagined just
85 a few short years ago. This technology is offering
86 opportunities to reduce healthcare costs, improve healthcare
87 quality, and most importantly, to save lives.

88 The significance of the Internet of Things is that these
89 types of benefits are not unique to healthcare. This
90 technology truly has the potential to transform every sector
91 of the economy in most profound ways. Notwithstanding the
92 economic and societal benefits of the Internet of Things, the
93 consumer impact of this market should be a key focus of our
94 discussion today. While consumers are benefitting from the
95 technologies, attention must also be given to appropriate
96 consumer protections for privacy and security.

97 Today we will explore these issues, and we should
98 recognize that not all devices are created equal. They are

99 manufactured for different purposes. They have different
100 capacities, and they generate varying levels and degrees of
101 consumer information. Unlike other established markets, the
102 Internet of Things is still developing, and quite honestly,
103 we are trying to understand the nature and basis of the
104 threats that face this ecosystem. In our examination of
105 privacy and security issues, it is important that we balance
106 these concerns with the creativity and innovation that is
107 driving this market. Too much potential for economic
108 progress and consumer welfare is at stake to act without a
109 full appreciation for what this market can offer.

110 [The prepared statement of Mr. Burgess follows:]

111 ***** COMMITTEE INSERT *****

|
112 Mr. {Burgess.} I want to thank the witnesses again for
113 making time to be with us here this morning. I look forward
114 to an informative and engaged discussion on this very
115 important topic and now would like to yield back my time and
116 recognize the Subcommittee Ranking Member Ms. Schakowsky, for
117 the purpose of an opening statement.

118 Ms. {Schakowsky.} Well, you don't think often of events
119 in this building as being like really fun, and this is a day
120 that we can say that it is because the showcase down the hall
121 is very, very exciting. And we are going to hear about
122 things that I think certainly can enhance and spice up and
123 make our lives easier and better from incredible
124 entrepreneurs. So I want to thank you all for being here
125 today. I want to thank the chairman for holding the showcase
126 and the hearing.

127 I would like to take a moment to introduce one of our
128 witnesses, Brad Morehead, CEO of LiveWatch Security, which
129 does have a demonstration over in the showcase. It is an
130 innovative company from my hometown of Evanston, Illinois,
131 that uses the Internet of Things technology to better
132 protect, inform, and connect its customers. LiveWatch has
133 been honored with the 2014 gold Stevie Award for Customer
134 Service, the 2013 silver Stevie Award for E-commerce Customer

135 Service, and was recognized as an enterprise leader by The
136 Economist.

137 Mr. Morehead also participated in our showcase this
138 morning. I welcome him and thank him for his time today as
139 someone who often has people coming in and out of my house
140 who don't always know the code on my security system and
141 someone who regularly can't find her key. I want to tell you
142 that these kinds of technologies can mean a lot in my life.

143 The Internet of Things is one of the fastest-growing
144 technologies today. An estimated 25 billion products are now
145 connected to the Internet, and that number is expected to
146 double by 2020. Internet of Things technology brings very
147 clear benefits to consumers, vehicles that can tell a driver
148 if a part is in need of replacement, as the chairman
149 mentioned, refrigerators can tell a parent to buy another
150 gallon of milk, health gadgets that monitor a person's heart
151 rate, running or walking speed, distance covered. All of
152 these products and many more are made possible through the
153 Internet of Things.

154 But this technology also presents some new challenges.
155 How do we ensure that these technologies are secure? The
156 chairman was right to raise the question of the important
157 balance, that sensitive information doesn't get out to
158 unintended audiences or that products connected to the

159 Internet aren't remotely deactivated by an unauthorized user.
160 We must ensure that as this technology continues to grow we
161 take common-sense steps to assure that it is safe and secure.

162 These are issues worthy of the subcommittee's time and
163 consideration. Again, I look forward to hearing from this
164 distinguished panel about how they are creatively harnessing
165 the Internet of Things, and I would yield at this time for
166 Mr. Cardenas.

167 [The prepared statement of Ms. Schakowsky follows:]

168 ***** COMMITTEE INSERT *****

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169 Mr. {Cardenas.} Thank you. Good afternoon. I want to
170 thank the ranking member for yielding me some of her time. I
171 want to introduce Brian Van Harlingen, the Chief Technology
172 Officer at Belkin. Belkin is a local Los Angeles company,
173 and we are proud of them. And they have been doing a great
174 job as a driver for jobs and innovations in our great city.

175 Since the 1980s, Belkin has been on the forefront of
176 innovation creating products that benefit all of our
177 constituents in their daily lives. I look forward to
178 watching how Belkin will use what we are calling the Internet
179 of Things to bring new products and services to their
180 consumers, and I look forward to their testimony today. So
181 welcome to Washington, D.C., and thank you so much for your
182 testimony.

183 I yield back my time to the ranking member.

184 [The prepared statement of Mr. Cardenas follows:]

185 ***** COMMITTEE INSERT *****

|
186 Mr. {Burgess.} Does the gentlelady yield back?

187 Ms. {Schakowsky.} Oh, I yield back.

188 Mr. {Cardenas.} Okay. Thank you.

189 Mr. {Burgess.} I thank the gentlelady. The chair now
190 recognizes the vice chairwoman of the Full Committee, the
191 gentlelady from Tennessee, Ms. Blackburn, 5 minutes for an
192 opening statement.

193 Mrs. {Blackburn.} Thank you, Mr. Chairman. And I
194 really do appreciate the attention to this issue and that my
195 colleagues on both sides of the aisle are willing to work on
196 this. We don't need to let this get away from us if you
197 will. And Mr. Welch and I have put a great deal of attention
198 on the privacy and data security issue for the past couple of
199 years and thereby have had the opportunity with our
200 colleagues to dig a little deeper into some of these issues.

201 Going back to the chairman's remarks, I think it is
202 important that we look at size and scope when we discuss the
203 Internet of Things. You can look at Cisco's report, 50
204 billion devices, 50 billion devices connected to the Internet
205 by the time we get to the end of this decade. And then you
206 layer upon that what the expectations are for global economic
207 output and contribution to the global economy from this. And
208 right now and by the time we get to 2025, they are saying

209 \$2.7 to \$6.2 trillion looking at that. So when you look at
210 size and scope and impact, it behooves us to say, okay, how
211 do we get our hands around this and make certain that we
212 approach this in a light-touch way, that we encourage
213 innovation? As Ms. Schakowsky said, we rely on a lot of
214 these, and people like this because it does add convenience
215 to our lives. But that accelerates the additional problem of
216 privacy and security, whether it is B to B or B to C, and how
217 that is going to be filtered data and how we are going to
218 mine it and what we are going to extrapolate and how we
219 protect that, how we anonymize it, et cetera, et cetera. We
220 have to realize that we are still running and hopefully
221 always will on an open-source platform. Go back to when the
222 Internet started, four known users, four disparate in varied
223 locations, all known one to another, all vetted, all secure.

224 So we want to be here to enhance that experience for the
225 50 billion items that are going to be attached and still
226 provide the underpinning and infrastructure that was there
227 when it was the initial project of four known users.

228 So we welcome you all. We are going to be direct with
229 our questions and probably a bit more conversational than
230 some of the other hearings that you participate in.

231 Mr. Chairman, I thank you for the attention to the issue
232 and look forward to the discussion. I yield the balance of

233 my time for whomever would like to claim it.

234 [The prepared statement of Mrs. Blackburn follows:]

235 ***** COMMITTEE INSERT *****

|
236 Mr. {Burgess.} Does any other member of the Republican
237 side seek time? Seeing none, the gentlelady yields back her
238 time. The chair recognizes Ranking Member of the Full
239 Committee, Mr. Pallone, 5 minutes for an opening statement,
240 please.

241 Mr. {Pallone.} Thank you, Mr. Chairman. Today's
242 hearing gives us an opportunity to look at a new and evolving
243 technological development. The Internet of Things has great
244 potential for growing the American economy and offering
245 consumers new technology that will enrich their lives and
246 empower them in ways never before thought possible.

247 Earlier today, along with my colleagues, I had an
248 opportunity to see some of the innovation coming out of the
249 Internet of Things at a showcase hosted by the subcommittee,
250 and I was proud to have there IMPak Health, a New Jersey
251 company that is building wireless technologies into products
252 to solve practical healthcare needs. IMPak Health has taken
253 advantage of wireless technology to help ensure patients are
254 taking their medication and staying healthy. And the growth
255 in these types of devices is so rapid that they soon will be
256 as ubiquitous as electrical outlets. In fact, it is
257 estimated that there will be 50 billion connected products by
258 the year 2020.

259 But in many ways, the future is already here. Just last
260 Friday Tesla announced that it would remotely install
261 software updates in its Model S cars providing them with
262 capability of autonomous driving. Cars that drive themselves
263 were once found only in science fiction, but today it can be
264 a reality with a quick update sent over the Internet.

265 Yet, along with these innovations come some new
266 vulnerabilities, the vulnerabilities that we in Congress have
267 a responsibility to protect consumers against. Let us take a
268 hypothetical situation for a moment. Let us say that I wear
269 a bracelet that monitors different aspects of my health and
270 physical activity. It helps me keep track of how many steps
271 I take each day. It tells me how well I sleep at night. It
272 monitors my heart rate and along with an app in my phone, it
273 tracks where I have gone. While, all this data is important
274 to me, I may not want to have it released to a potential
275 employer who requires it as part of the job application. I
276 might not want the bracelet manufacturer selling it to an
277 insurance company who might then utilize it for my insurance
278 coverage, and I certainly do not want a hacker accessing the
279 bracelet to post my information on the Internet or to monitor
280 my location.

281 So without strong security and privacy protections,
282 consumers can be at real risk. These risks can have

283 devastating consequences when the product is accessed and
284 controlled remotely by an unscrupulous actor. One hacker has
285 shown that he can remotely access an insulin pump and induce
286 a lethal overdose. Others have shown that they can remotely
287 hijack the operations of a car, suddenly turning the wheel or
288 cutting off the brakes.

289 In order to protect consumers, there has to be strong
290 security and privacy protections built into these products.
291 By building in security, manufacturers can more effectively
292 prevent hackers from accessing a device or the data it
293 produces or collects.

294 At last week's hearing, the FTC's witness stated that
295 his experience in evaluating the vulnerability in Internet of
296 Things products has led the agency to recommend that device
297 security be added to data security and breach notification
298 legislation. By building in privacy, consumers could have
299 confidence in these products, and consumers need to know that
300 their intensely personal information will not be shared with
301 the world without their consent.

302 So I am confident great things will be done through the
303 Internet of Things, but I believe that while we encourage
304 innovation through these new technologies, we also have to be
305 innovative in how we protect the consumer. I yield back. I
306 don't think any other member on our side wants the time. So

307 I will yield--oh, you do? Okay. I will yield my remaining
308 time to the gentleman from California.

309 [The prepared statement of Mr. Pallone follows:]

310 ***** COMMITTEE INSERT *****

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311 Mr. {Cardenas.} Thank you very much. I would be remiss
312 if I didn't take this opportunity to thank Intel. So Ms.
313 Schooler, I just wanted to say thank you very much. Intel
314 made an announcement just a few months ago that they are
315 investing \$300 million into their internal diversity
316 initiatives over at Intel, and I hope that would be a
317 starting point for all of the industries to follow suit as
318 these industries are growing. They are the jobs of the
319 future. And for Intel to make that commitment and that self-
320 assessment is just wonderful. And many people on both sides
321 of the aisle believe that industry does a great job when they
322 police themselves and when they look in the mirror and they
323 say we can do better. And I think this is a great
324 opportunity for us to remind everyone that self-reflection
325 and self-understanding of where we stand as individuals or
326 organizations in the community certainly would give us an
327 opportunity to step forward and say we can do better. And I
328 think Intel has done a tremendous job, and thank you for that
329 commitment.

330 Thank you. I yield back my time.

331 Mr. {Burgess.} The chair thanks the gentleman. The
332 gentleman yields back.

333 So again, we want to welcome all of our witnesses, and

334 thank you for agreeing to testify before the subcommittee
335 today. Our witness panel for today's hearing will include
336 Mr. Daniel Castro who is the Vice President of the
337 Information Technology and Innovation Foundation; Mr. Brian
338 Van Harlingen who is the Chief Technology Officer of Belkin
339 International; Ms. Rose Schooler, Vice President of the
340 Internet of Things Group and the General Manager of the
341 Internet of Things Strategy and Technology Office at Intel
342 Corporation; and Mr. Brad Morehead, the Chief Executive
343 Officer at LiveWatch Security.

344 You each are going to be recognized in turn for 5
345 minutes for the purposes of an opening statement. Mr.
346 Castro, we will begin with you. You are recognized for 5
347 minutes.

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348 ^STATEMENTS OF DANIEL CASTRO, VICE PRESIDENT, INFORMATION
349 TECHNOLOGY AND INNOVATION FOUNDATION; BRIAN VAN HARLINGEN,
350 CHIEF TECHNOLOGY OFFICER, BELKIN INTERNATIONAL, INC.; ROSE
351 SCHOOLER, VICE PRESIDENT, INTERNET OF THINGS GROUP AND
352 GENERAL MANAGER, INTERNET OF THINGS STRATEGY AND TECHNOLOGY
353 OFFICE, INTEL CORPORATION; AND BRAD MOREHEAD, CHIEF EXECUTIVE
354 OFFICER, LIVEWATCH SECURITY, LLC

|
355 ^STATEMENT OF DANIEL CASTRO

356 } Mr. {Castro.} Thank you. Thank you, Chairman Burgess,
357 Ranking Member Schakowsky, and members of the committee. I
358 appreciate the opportunity to discuss the Internet of Things
359 with you today.

360 The Internet of Things represents the idea that ordinary
361 objects will be imbedded with sensors and connected to the
362 Internet. While many of these changes will be subtle, over
363 the long term, this technology could ultimately have an
364 enormously positive impact on individuals, businesses, and
365 society. For example, consider healthcare. Individuals can
366 use connected devices to prevent, screen, and diagnose a
367 variety of medical conditions. By collecting and tracking
368 data about their health, individuals can identify health

369 problems sooner, get treatment faster, and save on healthcare
370 costs.

371 For example, patients can use smart pill bottles to
372 receive automated alerts when it is time to take a dose, and
373 these types of interventions can help decrease the rate of
374 medication non-compliance which costs the United States
375 almost \$300 billion annually.

376 Or look at energy. The Internet of Things is helping to
377 provide solutions to the global energy challenge by enabling
378 clean energy technologies. For example, in home, connected
379 devices like smart thermostats can automate energy efficient
380 practices and save consumers money.

381 Or look at public safety. The Internet of Things helps
382 build not only smarter cities but safer cities. In homes
383 connected sensors can improve safety by detecting fires and
384 other emergencies quickly and reliably and alert authorities
385 sooner.

386 In vehicles, the sensors can detect a crash and
387 automatically alert emergency responders about the vehicle's
388 location and the number of occupants. Some of these systems
389 can even predict the injuries that might have resulted.

390 The availability of this real-time data is crucial in an
391 emergency since the faster response time can mean the
392 difference between life and death.

393 The Internet of Things is transforming industries like
394 manufacturing as well. Using low-cost sensors in automation,
395 factories can automatically turn off the lights and air-
396 conditioning when the workers leave, shut off valves if
397 sensors detect leaks, and shut down dangerous equipment if
398 sensors detect a malfunction. Innovative manufacturers can
399 use the data collected on the factory floor to gain insights
400 about the physical fabrication process, thereby improving
401 efficiency, increasing yields, and reducing product defects.

402 Manufacturers can also use sensors to collect real-time
403 data such as temperature and moisture about their shipments
404 to help ensure quality and optimize logistics. More
405 information can mean the difference between a recall and a
406 successful shipment.

407 As you can see, a significant amount of the data
408 collected by the Internet of Things will not involve
409 information about individuals but instead will be about the
410 environment, factories, vehicles, infrastructure, and other
411 electronic devices. And when data is collected about people,
412 much of it will be de-identified and aggregated. But when it
413 comes to personal privacy, Congress should tread lightly so
414 as to avoid impeding innovation. In particular, Congress
415 should recognize the privacy principles designed for a small-
416 data world do not work in a big-data world. Proposals such

417 as data minimization are based on the mistaken belief that it
418 is always possible to predetermine what information is useful
419 in the early stage and collect only that minimum amount.
420 Many of the benefits from data come from exploratory analysis
421 that finds new trends, relationships, and insights that were
422 not obvious at the outset. Restricting data collection could
423 severely curtail the many potential benefits of the Internet
424 of Things.

425 As more devices are connected to the Internet, it will
426 be more important than ever that they incorporate strong
427 security features. While the private sector is moving in the
428 right direction, Congress should further incentivize
429 companies to adopt strong security practices by adopting
430 policies that decrease the cost of strong security and
431 increase the cost of weak security. For example, Congress
432 should pass data breach notification legislation that
433 preempts state laws and reduces the legal compliance costs
434 companies face from abiding by multiple rules. This will
435 allow them to focus more resources on improving the security
436 of their products.

437 Congress should also pass cybersecurity information
438 sharing legislation to help organizations respond to real-
439 time threats.

440 Finally, Congress should encourage universities to

441 integrate cybersecurity training and to technical degrees so
442 that the next generation of coders and engineers build strong
443 security into their products. By improving education,
444 Congress can help raise the bar for security across the
445 entire U.S. tech sector.

446 The success of the Internet of Things will depend in
447 part on the actions of Congress. Just as the United States
448 needed a national broadband strategy, it also needs a
449 national strategy for the Internet of Things. Not only
450 should Congress avoid policies that would impose costs, limit
451 innovation, and slowed adoption, they should actively support
452 accelerating the development and deployment of the Internet
453 of Things, such as by creating pilot projects for smart
454 cities, encouraging smart infrastructure projects, and
455 designing an efficient regulatory review process for wearable
456 health technologies.

457 The Internet of Things has the potential to positively
458 impact virtually every industry from agriculture to
459 healthcare, and the Federal Government should be an active
460 partner in ensuring its success.

461 Thank you for the opportunity to speak with you today.
462 I look forward to your questions.

463 [The prepared statement of Mr. Castro follows:]

464 ***** INSERT 1 *****

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465 Mr. {Burgess.} The chair thanks the gentleman. The
466 gentleman yields back. Mr. Van Harlingen, you are recognized
467 for 5 minutes for the purpose of an opening statement,
468 please.

|
469 ^STATEMENT OF BRIAN VAN HARLINGEN

470 } Mr. {Van Harlingen.} Thank you, and good morning,
471 Chairman Burgess, Ranking Member Schakowsky, and members of
472 the Committee. Thank you for holding this important hearing
473 on the Internet of Things, otherwise known as IoT. My name
474 is Brian Van Harlingen, and I am the Chief Technology Officer
475 at Belkin International.

476 Belkin is the maker of the WeMo home automation brand,
477 which allows users to remotely measure, monitor, and manage
478 their homes via a software suite including applications,
479 cloud infrastructure, and a portfolio of more than 25
480 connected devices. Surpassing 1 million activations, the
481 WeMo ecosystem ranges from switches to lighting to home
482 appliances.

483 After years of talk, the Internet of Things has arrived,
484 and the pace of innovation is accelerating at a phenomenal
485 speed. We are pleased that Congress and other policy makers
486 have joined the conversation, as policy awareness and
487 leadership will help to maximize the benefits of this
488 technological revolution and ensure consumer confidence. IoT
489 will drive economic growth, create jobs, and facilitate
490 entrepreneurship in completely new markets.

491 In my testimony, I will discuss three key topics:
492 consumer benefits, technological considerations, and privacy
493 and security.

494 First, consumer benefits. WeMo has been designed as the
495 most approachable entry point into the smart home.
496 Affordable and easy to use, WeMo provides bite-sized
497 solutions to make consumers' lives easier, simpler, and
498 better. WeMo's new Echo technology uses the home's existing
499 infrastructure to monitor, measure, and manage water,
500 electricity, and natural gas usage. Using advanced data
501 science and machine learning, these technologies have
502 enormous potential to save both money and resources.

503 As a connected solution, WeMo gains insight into how
504 consumers use WeMo devices in order to provide better
505 experiences and design future products. For example, through
506 data analytics, we learned that consumers were finding ways
507 to turn on their devices at sunrise and sunset, so we built
508 that functionality directly into our WeMo app. We also
509 learned that most WeMo Switch users were using them for
510 lighting purposes. So we developed and marketed the WeMo
511 Light Switch as our next product. These are examples of how
512 we use the data from the WeMo cloud to drive better
513 experiences for our consumers.

514 Second, technological considerations. IoT for the home

515 and business cannot exist without two primary technologies:
516 Wi-Fi and smart devices. As the maker of both WeMo and
517 Linksys Wi-Fi routers, Belkin understands both markets. Wi-
518 Fi has been widely adopted with a 61 percent penetration rate
519 in U.S. homes. WeMo products use familiar Wi-Fi technology.
520 They do not rely on hubs for connectivity or intelligence.
521 WeMo can integrate directly into partner products and serve
522 as an on-ramp to the Internet of Things for everyday products
523 like Crock-Pot slow cookers, Mr. Coffee coffeemakers, and
524 Osram Sylvania light bulbs.

525 From a policy perspective, the government and Congress
526 can help promote and grow the Internet of Things by making
527 sure these devices can talk to each other. Wireless
528 spectrum, already an important technology policy issue,
529 becomes even more important as IoT adoption accelerates and
530 billions of new devices come on line. Congress and the FCC
531 should continue to free up new spectrum, particularly on an
532 unlicensed basis. Failure to expand spectrum will stifle IoT
533 innovation and growth.

534 Last but not least, privacy and security. At WeMo, we
535 believe the nascent IoT market will benefit when consumers
536 know privacy and security are our top priorities. We believe
537 the Federal Government can take a light-touch regulatory
538 approach and work with the industry to ensure consumer

539 confidence.

540 We applaud this committee's efforts to pass data breach
541 legislation that would address the patchwork of state data
542 breach laws. WeMo has a very transparent data policy and
543 strictly controls all PII. The data collected from WeMo
544 devices is aggregated and anonymized. Non-personal
545 information is used to identify trends, to improve network
546 performance, and to provide additional benefits to consumers.
547 We understand the importance of data security and employ a
548 combination of industry-led security standards, procedures,
549 and organizational measures.

550 We have safeguards in place to prevent security breaches
551 and work closely with outside security researchers to
552 identify and address potential security vulnerabilities. We
553 support the latest security applications and continuously
554 improve and push consumer device firmware and application
555 updates. Security will always be a top priority, and as the
556 technology evolves, so will our efforts to provide safe and
557 secure products for consumers.

558 In conclusion, at WeMo, we are focused on delivering the
559 most user-friendly, innovative, and secure products. I
560 appreciate the opportunity to testify today and to share our
561 vision of the Internet of Things and answer any questions the
562 committee might have.

563 [The prepared statement of Mr. Van Harlingen follows:]

564 ***** INSERT 2 *****

|
565 Mr. {Burgess.} The chair thanks the gentleman. The
566 chair now recognizes Ms. Schooler 5 minutes for the purpose
567 of an opening statement, please.

|
568 ^STATEMENT OF ROSE SCHOOLER

569 } Ms. {Schooler.} Good morning, Chairman Burgess, Ranking
570 Member Schakowsky, and members of the subcommittee. Thank
571 you for the opportunity to provide testimony on the
572 importance of the United States' establishing a global
573 leadership role in the Internet of Things or the IoT.

574 As head of Intel's IoT's Strategy and Technology Office,
575 own the IoT strategy for the company. Intel's 30 years of
576 investment, innovations, and standards leadership in the
577 evolution of computing provide the foundational elements of
578 the strategy. Intel believes the IoT presents a
579 transformational opportunity for the United States and for
580 the world. It will enable innovation, increase productivity,
581 and deliver efficiencies across the public and private
582 sector. While some think of the IoT as smart thermostats and
583 wearables, these consumer devices are only a few of the many
584 applications. The primary economic driver will be non-
585 consumer areas such as industrial and commercial
586 applications. I will address three topics that are important
587 to consider as you chart your policy. One: Why is the IoT
588 important? Two: What are the barriers to a successful IoT
589 ecosystem? And three: How can policymakers accelerate

590 deployments to ensure U.S. leadership?

591 First: Why is the IoT important? It will drive
592 unprecedented benefits for government, businesses, consumers,
593 and communities. It is estimated that 50 billion devices
594 will connect to the Internet by 2020 generating 44 zettabytes
595 of data. Consider that in 2009, the World Wide Web was
596 estimated at just a half a zettabyte. The IoT presents the
597 opportunity to connect these devices, efficiently analyze the
598 data, and use the information to improve our decision-making.
599 In doing so, the IoT is expected to have a multi-trillion
600 dollar global economic impact. What should most excite U.S.
601 policymakers is that America and other developed economies
602 are expected to capture 20 percent of this impact if we lead.

603 Let us consider one IoT application. Saia Trucking is
604 located in Georgia and has a nationwide fleet of 3,000
605 trucks. They recently deployed an Intel-based IT solution
606 which alters routes and guides drivers' performance real-
607 time. Saia increased fuel efficiency by 6 percent
608 translating into \$15 million of annual savings. The U.S.
609 trucking industry consumes 54 billion gallons of fuel per
610 year. Extrapolating that success, our Nation could save over
611 3 billion gallons of fuel yearly while reducing our CO2
612 emissions.

613 What are potential barriers to a successful IoT

614 ecosystem? One barrier as noted could be security. It is
615 not implemented from the outset. For this reason, Intel
616 prioritizes security as the foundational element of our IoT
617 strategy. We will integrate security at the outset building
618 cryptography into our chips to enable strong identity and
619 data protection. In addition to the compute device itself,
620 our solutions will employ advanced software security to
621 prevent harmful applications from being activated on the
622 device or taking down the network. Integrating multiple
623 layers of security at the outset enables trusted data
624 transmission necessary for successful IoT deployments.

625 Other potential barriers include connecting to legacy
626 infrastructure, interoperability between devices, and
627 developing global standards. To address these barriers,
628 Intel collaborated with industry leaders to define five
629 tenants of successful IoT solutions. They are security, ease
630 of connectivity, interoperability, data analytics, and ease
631 of deploying new applications and services. Based on these
632 tenants, we recently launched the Intel IoT platform.

633 Finally, how can policymakers accelerate IoT deployments
634 to ensure U.S. leadership? Candidly, the United States is
635 behind. Other countries are aggressively investing and
636 deploying IoT implementations to transform their economies,
637 address societal problems, and spur innovation. China,

638 Brazil, Germany have all adopted national IoT plans with
639 time-bound goals and are investing heavily in IoT R&D and
640 infrastructure. The United States must leverage our vast
641 resources and capabilities, promoting industry alignment
642 around these large-scale IoT deployments based on secure,
643 open, and interoperable solutions will showcase U.S.
644 leadership.

645 Congress can advance our Nation's IoT momentum by
646 collaborating with industry to establish a national IoT
647 strategy, encourage public/private partnerships, and invest
648 in IoT research. Intel is confident that the United States
649 can lead the IoT transformation with a continued open
650 dialogue as you are doing here today and by implementing some
651 of these recommendations.

652 Thank you for your time, and I look forward to your
653 questions.

654 [The prepared statement of Ms. Schooler follows:]

655 ***** INSERT 3 *****

|
656 Mr. {Burgess.} Thank you. The chair recognizes Mr.
657 Morehead for 5 minutes for the purpose of an opening
658 statement, please.

|
659 ^STATEMENT OF BRAD MOREHEAD

660 } Mr. {Morehead.} Thank you, Chairman Burgess, Ranking
661 Member Schakowsky, and members of the committee. We use the
662 IoT every day when we check traffic or look at the weather
663 forecast. We also see it in the wide variety of smart
664 devices that are popping up everywhere, like smart
665 refrigerators, smart coffee makers, or smart watches. But
666 rather than talking about smart coffeemakers and
667 refrigerators, I would prefer to illustrate the potential
668 benefits of a robust Internet of Things by sharing a brief
669 story about how the security alarm industry works.

670 Imagine an emergency at your home or at your school or
671 at your work, a burglary or violent crime in progress with
672 multiple potential victims on the scene where the intruder or
673 the victim has triggered an alarm. Speed and information are
674 critically important to the first responders. However, when
675 that security alarm goes off at that home, business, or
676 public location, that signal is delayed for over a minute to
677 reduce false alarms. Furthermore, the process of notifying
678 the alarm monitoring center is surprisingly manual, as the
679 alarm is transmitted after the delay to a person in the alarm
680 center who must then be connected to another person at a 911

681 public safety answering point, or PSAP, for emergency
682 dispatch.

683 After an average 1- to 3-minute phone conversation
684 between that security station and the PSAP safety agency,
685 emergency responders are contacted and dispatched to the site
686 of the alarm--again, where time is of the essence. But the
687 first responders are given nothing more than basic
688 information about the type of alarm and location of the
689 incident. This average dispatch total can take 5 to 10
690 minutes, and that is valuable time and information that is
691 lost in a true emergency. By some estimates from the DOJ,
692 each year more than 1 million police hours are wasted due to
693 these human errors and communication issues in this
694 transmission process.

695 Adding to that frustration is the fact that there may be
696 additional security cameras, motion sensors, door sensors, or
697 other sensors at the site of the emergency capturing valuable
698 information. Unfortunately, in most cases, those additional
699 sensors and cameras have no way of communicating to the
700 monitoring station, 911 PSAP, or the first responders.

701 In other words, there is potential lifesaving data
702 available that no one sees. This can cause first responders
703 to arrive at the wrong place at the wrong time and without
704 important information to save lives.

705 With the IoT, these processes could be seamlessly
706 automated and integrated to prevent and mitigate crimes in a
707 more efficient way. In the future, the transmission of
708 emergency alarms and sensor data could occur instantly from
709 machine to machine, or M-2-M, instead of manually. Automated
710 applications could be used to gather and interpret the alarm
711 information from various IoT devices to determine the
712 probability of a false alarm or help first responders use
713 their time more efficiently and arrive at the right place.
714 Smart sensors and cameras could be used to automatically
715 transmit images and data from the scene of the crime directly
716 to the officers.

717 Using IoT, two companies and centers were able to cut
718 alarm transmission times down to 5 seconds and reduce the
719 volume of calls going between these centers by 10 percent.
720 Now imagine if that was implemented nationwide, how much more
721 productive our police, fire, and EMT responders could be with
722 fewer false alarms and better, faster information from IoT
723 connected systems and devices. Internet of Things can help
724 deliver first responders to the scene faster, more
725 efficiently and with more information on the current
726 emergency, if we invest now in the IoT infrastructure that we
727 need so that we go beyond smart coffeemakers and
728 refrigerators.

729 Unfortunately, there are still a few technological
730 barriers that are preventing us from implementing an ideal
731 system. The IoT consists of a few key components: a power
732 source, a communication protocol and data processing.

733 Let us begin with power, since this is a subcommittee of
734 the Energy and Commerce Committee. These connected sensors
735 in the Internet of Things must have a power source, and while
736 wired is preferred in some cases, it is typically too
737 expensive to implement. Therefore battery power offers the
738 widest array of uses, but the currently short battery life
739 must be improved to lower the cost of ongoing maintenance and
740 fully tap the potential of IoT.

741 As an example of this, recently a tech startup called
742 Quirky developed a smart egg holder that would tell you when
743 you were out of eggs in your refrigerator. This sounds like
744 an interesting and useful, but due to current battery
745 technology, it unfortunately it needed its batteries replaced
746 more often than it ran out of eggs to replace. So when lives
747 are on the line instead of omelets, we need to make sure that
748 these smart devices don't lose power. This will require
749 investment in more powerful batteries with longer lifespans.

750 Secondly, we need to insure the availability of open
751 wireless spectrum for IoT and specifically IoT for public
752 safety agencies. A government program called FirstNet is

753 developing new wireless applications to aid first responders
754 instead of existing radio-dispatch technology first used in
755 the 1960s. We need more funding for projects that involve
756 improving our Nation's infrastructure for wireless
757 integration and emergency dispatch.

758 As an example of our outdated emergency infrastructure,
759 currently only about 200 out of 5,900 911 PSAP centers can
760 handle text messages. Text messaging has been around for 20
761 years, but approximately 3 percent of 911 centers can receive
762 texts. And when you consider that 96 percent of young people
763 text regularly but only 67 percent make phone calls
764 regularly, you can see how much emergency information we may
765 be missing.

766 Also in our way looms the threat of multiple connection
767 standards for smart devices. Computers generally connect to
768 the Internet using one of two methods, Ethernet or Wi-Fi.
769 However, smart devices connect using a plethora of standards
770 including Wi-Fi, Bluetooth, Ethernet, z-wave, ZigBee, and
771 Thread, in addition to numerous proprietary protocols. So
772 currently a Nest thermostat may know the temperature in a
773 home is increasing due to a fire but it is unable to contact
774 the 911 PSAP through the security system if the homeowner is
775 asleep or unavailable. IoT standards and interconnectivity
776 would solve this.

777 As an example, my company, LiveWatch Security, developed
778 As Soon As Possible Emergency Response, or ASAPer, which is
779 an application that is a step in that direction. It combines
780 the speed of machine-to-machine communication with the latest
781 group chat communication technology to allow people to
782 process this information from the IoT and sensors. This IoT-
783 enabled system has reduced false alarms by up to 30 percent
784 while also improving response times, in some cases, by 80
785 percent. We must continue to invest in the entrepreneurs
786 that will develop these new applications and improve the way
787 we process data from the IoT to turn it into useful
788 information for our first responders.

789 These are all issues that can be solved with additional
790 smart investment in the smart things that make up the
791 Internet of Things. We can obtain the most progress towards
792 eliminating these obstacles by focusing on engineering
793 advances in battery efficacy and low-power radio range,
794 finding better ways to utilize wireless spectrum for first
795 responders and creating standards for communication between
796 the IoT ecosystems, and finally, investing in better first-
797 responder infrastructure that can handle new types of
798 communication to, and from, IoT devices and users.

799 We are at the beginning of the next big shift in
800 technology where machines and devices can talk to each other

801 and instantly share data in ways that change lives.

802 We can use IoT to enhance the security of Americans and
803 the safety of our first responders. To me, these are
804 compelling reasons to invest in this new frontier of
805 technology. Thank you.

806 [The prepared statement of Mr. Morehead follows:]

807 ***** INSERT 4 *****

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808 Mr. {Burgess.} The chair thanks the gentleman for his
809 remarks. We will now move into the question-and-answer
810 portion of the hearing. I will begin by recognizing myself 5
811 minutes for the purpose of questions.

812 I want to ask a couple of general questions just on the
813 general theme of the governance of the Internet of Things,
814 and I would like to ask each panelist to respond briefly in
815 turn. And Mr. Castro, we will start with you. It is an
816 open-ended question, and I will acknowledge that. And many
817 of you have already addressed this partially in your
818 testimony, but what do you see is the appropriate role of
819 Congress right now relative to the Internet of Things,
820 bearing in mind we are marking up data breach notification
821 tomorrow and probably before the spring is over, we will have
822 a mark-up on patent demand letters. But irrespective of
823 that, I welcome your thoughts.

824 Mr. {Castro.} Sure. Absolutely. I think the number
825 one issue right now, just because it is growing in attention,
826 is data breach. We saw, you know, so many data breaches over
827 the past year, high profile. This is something that
828 Americans are worried about, and it is something where I
829 think Congress could take an immediate and important step.
830 But long-term, as I think you have heard from at least two

831 panelists up here, we are really thinking about national
832 strategy for the Internet of Things. This is something that
833 Congress can get behind, that the Federal Government can get
834 behind, and you really create a new vision for the future of
835 commerce, the future of houses that interact with technology
836 and how we can have an impact in so many different areas.

837 Mr. {Burgess.} Thank you. Mr. Van Harlingen?

838 Mr. {Van Harlingen.} As has been mentioned, I think
839 data breach management and rules around that and consistency
840 around that nationwide would be very helpful to both the
841 industry and consumers.

842 As I mentioned in my opening statement, I think spectrum
843 management, both for the unlicensed spectrum and as Mr.
844 Morehead mentioned, for emergency first responders in a more
845 licensed fashion would be very good investments of time for
846 the committee and for the Federal Government.

847 I would advocate a light-touch approach. This is a very
848 new and emerging space where we have a lot to learn about
849 what is possible and what value we can create.

850 Mr. {Burgess.} Thank you. Ms. Schooler, your thoughts
851 on the appropriate role of Congress.

852 Ms. {Schooler.} Yeah, absolutely. I think it is
853 starting today, an open dialogue between industry and
854 government, consumer groups to get the needs and the

855 interests of the consumers on the table as we chart policy
856 moving forward as well as people from industry environments.

857 I think we need, as I mentioned in my statement, to
858 encourage a focus on security and interoperability. I think
859 the opportunity to leverage public and private partnerships
860 will be key, and I think even if you look at the
861 infrastructure and the capabilities within transportation's
862 \$351 billion opportunity in that segment over I think it is
863 650,000 fleets and tires and trucks within the Postal Service
864 in the U.S. Government, excellent opportunity to try out some
865 of this technology with public and private partnerships.

866 We talked about a national IoT strategy. I think that
867 is critical moving forward. And again, open standards, open
868 architecture, open source, interoperability, allow for the
869 continuation of innovation.

870 Mr. {Burgess.} Very good. Mr. Morehead?

871 Mr. {Morehead.} I agree on the points about open
872 standards and interconnectivity. For most of the sensors, I
873 think that investment in battery power and improved
874 performance for batteries will be incredibly important as we
875 develop new sensors. But finally I do think investing in the
876 infrastructure of our Nation's PSAPs and emergency first
877 responders is incredibly important.

878 There was an article in the Journal recently about a

879 company called Smart Things, and the journal reviewed the
880 technology of smart things. And at the end of the article,
881 what they found is that the most compelling use of the
882 technology was turning on the coffeemaker in the morning,
883 which frankly wasn't compelling, was the summary of the
884 article.

885 When you talk about investing the types of time and
886 money that you would be investing, I think you could look to
887 the Nation's infrastructure and truly save lives which has an
888 immeasurable benefit of both the first responders and
889 potential victims by investing in the public infrastructure
890 and the PSAPs to get the right information distributed to
891 emergency first responders faster. And that has a higher--a
892 faster payback than potentially some other projects.

893 Mr. {Burgess.} Great. I thank all the panelists for
894 their thoughts on that. Just being mindful that I want to
895 stay within the constraints of 5 minutes because I am going
896 to insist that everyone else do that on the dais, Mr.
897 Morehead, you referenced the fact that, well, the Journal
898 article about the coffeemaker, well, that is really not that
899 important. But what some days seems trivial to one person
900 may down the road actually be very significant, and I guess
901 the overarching theme here is a regulatory touch. You heard
902 Ms. Blackburn mention it, the light regulatory touch. Could

903 each of you speak in one word or two words to the regulatory
904 touch that you would like to see on the side of the agencies?

905 Mr. {Castro.} I think we want to embrace innovation and
906 let, you know, let these companies--you saw the showcases out
907 there today. Imagine what it will look like 10 years from
908 now. You want to see that innovation flourish.

909 Mr. {Burgess.} Mr. Van Harlingen?

910 Mr. {Van Harlingen.} Agreed, a light touch that fosters
911 innovation and creativity and exploration in this space.

912 Mr. {Burgess.} Great. Ms. Schooler?

913 Ms. {Schooler.} Light touch to spur innovation.

914 Mr. {Morehead.} The coffee from the smart coffeemaker
915 is good dark, but regulatory touch I think would be better
916 light.

917 Mr. {Burgess.} Very good. You have all allowed me to
918 fit within the constrains. I will now recognize the Ranking
919 Member of the Subcommittee Ms. Schakowsky 5 minutes for
920 questions, please.

921 Ms. {Schakowsky.} Thank you very much for all your
922 testimony. I wanted to give a little bit of opportunity to
923 Mr. Morehead to tell us a little bit more about LiveWatch.
924 Mr. Morehead, home security systems have been in existence
925 long before 2002 when LiveWatch was created. So as we
926 increase our technologies, et cetera, what motivated you and

927 your business partners to enter this space? And how do you
928 think that what you are doing improves consumer experience?

929 Mr. {Morehead.} Thank you, Ranking Member Schakowsky.
930 When we entered the space, we saw an opportunity with a
931 business model in the home security industry that was
932 relatively unchanged for decades, predominantly ADT where
933 customers were paying significant amounts of money and not
934 getting the value that they needed. And we saw an
935 opportunity to bring a technology focus, a disruptive
936 technology focus to a relatively nascent industry.

937 And the nice thing about home security is it is formed
938 upon a foundation of security, right? We talk about security
939 and privacy here, home security is by definition focused on
940 security. So we use that as a foundation to disrupt the
941 business by going direct to consumers and lower their prices
942 by about 30 to 50 percent, by eliminating the middlemen of
943 sales and delivery and having customers self-install their
944 wireless systems.

945 So all of our infrastructure is wireless. It is formed
946 on a basis of security, and then from that point, we added
947 layers of additional technology, received multiple patents
948 for that to determine how customers could use the information
949 that was flowing from those systems. Specifically the
950 opportunity we saw there is a home security system was really

951 Internet of Things before there was an Internet of Things.
952 We have sensors in homes and businesses throughout the
953 country, throughout the world. Those produce data. That
954 data is then transmitted to a central station where it looks
955 for alarms.

956 But the fact of the matter is, we can do additional
957 things with that information, and that is where we have taken
958 the next step with our product, ASAPer, to allow customers to
959 process the information, the data coming from those devices,
960 in a more effective way.

961 Ms. {Schakowsky.} Are you concerned at all? Because a
962 number of people will be contacted that there is some sort of
963 breach of security in the home, right? How do you protect
964 against unwanted invasions of that information that is
965 circulated to a certain population of people, family members
966 for example?

967 Mr. {Morehead.} The main thing that we try to do is we
968 limit the information to the people that the homeowner or the
969 business owner specifically selects to receive that
970 information. So we keep it in a tight-knit group that is
971 selected by that person to receive the information.

972 The challenge is that there is power in numbers, and so
973 we want to get the information to as many people as we can in
974 an emergency because we are looking for the one person that

975 knows what is actually happening and that can help resolve
976 it.

977 So we need to get it ideally just to the one person that
978 knows, but to do that we have to get the information to
979 multiple people. So we allow the homeowner to put those
980 people on the list, and then we bring them into a group chat
981 to help facilitate the resolution of that alarm signal. And
982 we found that thus far, implementing the right technology and
983 security on the back end, it has been a productive way to do
984 it. And instead of having two to three fixed members on an
985 alarm distribution list, we have tested it with up to in a
986 school setting, up to 170 people simultaneously on one group
987 chat to see what would happen if there was an emergency at a
988 school and there is no other system that can facilitate that
989 communication.

990 Ms. {Schakowsky.} Have you seen any particular problems
991 that result from having a universe as large as 170?

992 Mr. {Morehead.} At this point we have not. Overall it
993 has been pretty positive. I think that there is some
994 learning curve for consumers and users as they get up to
995 speed and say, oh, I am chatting and trying to have a
996 conversation with 170 other people. But in the end, what you
997 tend to find is that only one or two people actually step up
998 in that conversation because they are the ones with the

999 relevant information. So of that 170, we are really just
1000 looking for the one or two people that can help resolve the
1001 situation.

1002 Ms. {Schakowsky.} Thank you. Mr. Castro, you said
1003 something interesting at the end of your written testimony
1004 about education and building cybersecurity education. I am
1005 going to read it. Congress should encourage universities to
1006 integrate cybersecurity training into technical degrees so
1007 that the next generation of coders, engineers, build strong
1008 security into products at the outset.

1009 Do we not do that now as we are training people?

1010 Mr. {Castro.} Yeah, it is a great question. I mean,
1011 the field of information security has evolved over time. So
1012 originally many of the problems that we saw in computer
1013 systems were because the coders weren't thinking about the
1014 security issues, and you had people fixing that afterwards.
1015 As we are moving into the Internet of Things, we want people
1016 to be thinking about the big issues that exist today and how
1017 they can fix them at the outset rather than doing it later
1018 on.

1019 Ms. {Schakowsky.} Thank you. I think universities and
1020 educational systems have a role, too, to play, and I thank
1021 you for pointing that out.

1022 Mr. {Burgess.} The chair thanks the gentlelady. The

1023 gentlelady yields back. The chair recognizes the gentlelady
1024 from Tennessee 5 minutes for questions, please.

1025 Mrs. {Blackburn.} Thank you, Mr. Chairman, and I have
1026 got three questions, and I want to hear from each of you on
1027 them. So I appreciate brevity. And if you want to expand to
1028 anything further, please do it in writing within the next
1029 week or so.

1030 First of all, let us talk about privacy because that is
1031 always top of mind. What is this going to do to me if I use
1032 this thing? And when you talk about big data and the
1033 explosion of data that is out there, first of all, let us
1034 look at it like this. What do you think the trend is for
1035 growth of data on the Internet? Are we going to continue to
1036 see this explosion? And secondly, what should Congress' role
1037 be in protecting that data? And let us just start. Very
1038 quickly, Mr. Castro, I am going to start with you. Let us
1039 work down so we can move to question two.

1040 Mr. {Castro.} Sure. So in terms of the trend, it is
1041 increasing.

1042 Mrs. {Blackburn.} Okay.

1043 Mr. {Castro.} Do you want me to address the second
1044 part?

1045 Mrs. {Blackburn.} Sure.

1046 Mr. {Castro.} Yeah, and so the second part about this

1047 is, you know, Congress should be really looking at how
1048 consumers are hurt or not hurt by the use of the data.

1049 Mrs. {Blackburn.} So define harm?

1050 Mr. {Castro.} Define harm and not regulate the
1051 collection. We want data to be collected and shared.

1052 Mrs. {Blackburn.} Okay. Yes, sir?

1053 Mr. {Van Harlingen.} So I agree the trend is huge. The
1054 amount of data that we have is directly proportional to the
1055 value we can create, and I think the way to deal with it as
1056 in the FTC's recommendations is pay very attention to
1057 providing notice and choice to the consumers.

1058 Mrs. {Blackburn.} Okay.

1059 Ms. {Schooler.} I saw data recently where 90 percent of
1060 the data today was created in the last two years.

1061 Mrs. {Blackburn.} That is right.

1062 Ms. {Schooler.} I think that is indicative of the pace
1063 of innovation and the creation of data, and I think whatever
1064 we say in terms of data growth, we will be grossly wrong.

1065 Mrs. {Blackburn.} Okay.

1066 Ms. {Schooler.} We will under-call it. What do we need
1067 to do from a policy perspective? Again, I think we need to
1068 bring multiple parties to the table. I think we need to
1069 bring the government, industry, consumer groups to understand
1070 what some of the use cases are and create policy around use

1071 case versus a broad, blanket policy to try to manage every
1072 scenario. And two, I think we need to build security in from
1073 the onset as I mentioned in my testimony from the device to
1074 the network to the cloud.

1075 Mrs. {Blackburn.} Okay.

1076 Ms. {Schooler.} And when we often say we want to create
1077 redundancy in that transmission, it means you don't always
1078 secure it at one point. You secure it throughout the
1079 transmission and the manipulation of the data. So those are
1080 my two comments.

1081 Mrs. {Blackburn.} Okay. Mr. Morehead?

1082 Mr. {Morehead.} I think there will obviously be
1083 substantial growth in the data. I think you will see
1084 multiple models emerge because this is not a winner-take-all
1085 market, and for lack of better terms, I will call it an Apple
1086 model and a Google model, an Apple model where the data is
1087 more private and a Google model where the data is used
1088 publically. The customer, the consumer, may get less
1089 expensive hardware, less expensive or free services, but the
1090 data will be used to provide other options. So I think
1091 multiple models will emerge for the data.

1092 Mrs. {Blackburn.} Okay. Second question, I want to
1093 look at education for consumers and some of the consent
1094 agreements that companies have when you are talking about the

1095 Internet of Things and the utilization of this data.

1096 Do you think that companies in these agreements for a
1097 particular service, did they adequately inform consumers and
1098 the consumers understand how this data is going to be
1099 utilized and what can be done to improve those privacy
1100 policies if you will so that consumers are offering true
1101 informed consent when they agree to utilization of some of
1102 the services that are there? And you know, one we discussed
1103 yesterday was insurance companies wanting you to utilize some
1104 type of component, and it gives you the number of hard breaks
1105 and fast stops and speeds driven, things of that nature. And
1106 we have got only 45 seconds left. So let me do this. I am
1107 going to -- I will ask for that response. I want to move
1108 onto the third question just to lay it out since we are going
1109 to run out of time, the economic impact. And Accenture had a
1110 great report on the economic impact of the Internet of
1111 Things. And I would like to get your take on that statement.
1112 We have it for you. And I want to know if you agree with it,
1113 and then I would like for you to speak specifically when you
1114 respond in writing to the challenges that exist in the United
1115 States to realizing this type of economic growth. What are
1116 the barriers to entry? What are the hurdles that are going
1117 to be there? What are we doing wrong from a regulatory side
1118 that are disenfranchising innovators? And I yield back my

1119 time.

1120 Mr. {Burgess.} The chair thanks the gentlelady. The
1121 gentlelady yields back, and those responses will be
1122 anticipated as written responses. Mr. Cardenas of
1123 California, you are recognized for 5 minutes for questions,
1124 please.

1125 Mr. {Cardenas.} Thank you, Mr. Chairman. The first
1126 question that I have is to Ms. Schooler. The City of Los
1127 Angeles is still a pretty big economic juggernaut for
1128 manufacturing in this country. When it comes to the Internet
1129 of Things and that type of innovation, what do we anticipate
1130 for manufacturing and production of products, et cetera, and
1131 the streamlining? And what is in the back of my mind is
1132 jobs, the opportunity to have successful businesses and
1133 therefore, a good, robust economy. So what can we expect
1134 going forward? Is this something that is going to be
1135 utilized more and more when it comes to manufacturing or
1136 something that we plateaued on where are we at, do you think?

1137 Ms. {Schooler.} Excellent question. We very much
1138 believe manufacturing will be smart manufacturing, in
1139 particular will be an excellent opportunity for the Internet
1140 of Things. At Intel we actually deployed a smart
1141 manufacturing pilot within one of our manufacturing
1142 facilities, and as you know, we make millions of things every

1143 year. So I think we are a pretty good test case. In that
1144 implementation we found that we collected data that allowed
1145 us to do predictive maintenance, and with predictive
1146 maintenance you increase up-time, you improve yields. And in
1147 that pilot, we realized a \$9 million return on that single
1148 opportunity for that pilot in that single factory.

1149 Accenture published a report recently that they said 87
1150 percent of the CEOs in the country see a long-term job growth
1151 opportunity, and I think to put that into practical terms, if
1152 you think about lowering the cost of goods sold, that is a
1153 great way to attract jobs back to the United States. So
1154 number one, let us optimize our manufacturing facilities from
1155 a product-cost perspective, use the technology to use
1156 predictive maintenance as a capability to increase up-times,
1157 again bringing down the total cost of goods, and to improve
1158 the utilization and the effective utilization rates of the
1159 equipment, again, improving output.

1160 So I think all of these things will result in job
1161 creation and bringing jobs back on shore.

1162 Mr. {Cardenas.} Thank you. And I like your example
1163 that you gave, and it reminds me that efficiency is a win,
1164 win, win, win, win, not only for the manufacturer but also
1165 for the consumer and for the community.

1166 Which leads me to my next question. Brian, if you could

1167 please. Hopefully it is a great answer for Los Angeles.
1168 California is going through a drought. We have yet to see
1169 the worst of it. So what do you see in the consumer space or
1170 even in the industrial space when it comes to efficiency,
1171 opportunities for energy, water, things of that nature with
1172 this technology?

1173 Mr. {Morehead.} So one of the technologies that we are
1174 working on in particular is a technology that we call Echo
1175 that allows the consumer's home or a business to monitor
1176 their energy use, their water use, in great detail through a
1177 single point using the existing infrastructure in the home.
1178 It is a very cost-competitive technology or cost-effective
1179 technology. We think we will educate people about how water
1180 and power are being used in their house and lead to improved
1181 behavior around that consumption.

1182 Mr. {Cardenas.} So you see a lot of advancements there
1183 and a lot more usage?

1184 Mr. {Morehead.} Absolutely. It is a place that we are
1185 putting a lot of our research efforts.

1186 Mr. {Cardenas.} Yeah. Hopefully it is a lot more
1187 efficient than pounding on the door when I tell my kids they
1188 have to take shorter showers.

1189 Mr. {Morehead.} Agreed. It is also very good at
1190 detecting leaks which are a huge source of water waste in the

1191 city.

1192 Mr. {Cardenas.} Absolutely. Well, thank you. And the
1193 last question to whoever would like to help enlighten us,
1194 what can we learn from the rest of the world? We are very
1195 spoiled in this country. We are still the economic
1196 juggernaut of the planet. We are looked to by many places
1197 around the planet for leadership. But once in a while we see
1198 ourselves looking and jog our head back and go wow. They got
1199 it right over there. They did something really cool or they
1200 did something that is advanced or something that we probably
1201 should have thought of but we didn't. What examples can you
1202 enlighten us about what is going on maybe around the world
1203 that we could learn from and then take their leadership?

1204 Mr. {Castro.} Well, something--and following up on your
1205 question about the water, if you look at India, I mean, so
1206 many countries have these big economic and social problems.
1207 They don't have any alternative but to go to the best
1208 technology and really look for an innovative solution. So in
1209 India, you know, they have decaying water infrastructure.
1210 Using smart technology, they are able to actually you know,
1211 cut significant waste at less cost than it would have been to
1212 replace the infrastructure. So really the United States
1213 should be looking at the same thing. We have decaying
1214 infrastructure. We just have a lot more money. So how can

1215 we do it really efficiently?

1216 Mr. {Cardenas.} Thank you. Real quick?

1217 Ms. {Schooler.} I would be happy to go next. I think I
1218 noted in my testimony that we see national IoT plans in other
1219 countries, Germany, Brazil, China. I definitely think as we
1220 had a broadband plan, we should have an IoT strategy and plan
1221 for the country. I think that would help us accelerate our
1222 learnings and accelerate our deployments which is critical.

1223 And just interestingly enough, a little tidbit from the
1224 demo room, I was talking to the SteadyServ beer keg optimizer
1225 which I think is a fascinating IoT use case. And in that
1226 deployment, one of the things that he was discussing and we
1227 were talking about was the adoption between the United States
1228 and Europe. Well, in Europe, they are looking at the
1229 opportunity, looking at the return on the investment in
1230 adopting the technology much more aggressively. And in the
1231 United States, there is still some hesitancy because it is
1232 not how we are used to doing it. And I think collectively
1233 between government and industry, large business and small
1234 business, we have to start embracing technology in a much
1235 more aggressive fashion than we have in the past.

1236 Mr. {Cardenas.} Thank you, Mr. Chairman. I yield.

1237 Mr. {Burgess.} The chair thanks the gentleman. The
1238 gentleman yields back. The chair recognizes the gentleman

1239 from New Jersey, vice chairman of the committee, Mr. Lance,
1240 for 5 minutes for your questions, please.

1241 Mr. {Lance.} Thank you, Mr. Chairman. And good morning
1242 to the panel. I was very pleased to see Alcatel-Lucent, Bell
1243 Labs, and Qualcomm representing the district I serve at the
1244 showcase today, and I thought it was a wonderful showcase.
1245 And I commend the chairman for his hard work in making sure
1246 that it occurred.

1247 Bell Labs demonstrated truly remarkable 5G wireless
1248 technology that will enable a variety of Internet of Things
1249 applications such as high-quality videos, smart meters, and
1250 connected cars. One thing is clear. Spectrum is one of the
1251 engines that will drive the Internet of Things revolution.

1252 To the panel in its entirety, what would you suggest
1253 that Congress do to provide the spectrum resources needed to
1254 support next generation networks in the Internet of Things?
1255 Mr. Castro?

1256 Mr. {Castro.} Thank you. As we can see in these demos
1257 and just looking around the market, there are going to be a
1258 growing number of devices, a huge number of devices
1259 everywhere. So I think just in general, we are looking for
1260 commercial spectrum to be available, both licensed and
1261 unlicensed, and that is something that I think we are just
1262 going to have--Congress will have to continue to monitor and

1263 promote.

1264 Mr. {Lance.} Thank you.

1265 Mr. {Van Harlingen.} I agree. I think that there are
1266 requirements for both licensed and unlicensed spectrum for a
1267 variety of different applications. I would encourage
1268 Congress to collaborate in detail with the industry on what
1269 those needs are and provide that spectrum as available.

1270 Mr. {Lance.} Thank you.

1271 Ms. {Schooler.} I agree with the previous comments. I
1272 think we need to leverage both the licensed and unlicensed
1273 spectrum, utilize the technologies that exist today to get
1274 the economies of scale that will enable us to drive and
1275 growth and accelerate deployments. That in lieu of looking
1276 at a specific use case and a specific spectrum band for IoT,
1277 I think we should leverage what we have today.

1278 Mr. {Lance.} Thank you. Mr. Morehead?

1279 Mr. {Morehead.} As we look forward, it is important to
1280 understand where we are going with the spectrum. I think
1281 that there are some lessons we can learn from the past. One
1282 of the challenges for those of us that have been doing IoT
1283 for the last decade or so is backward compatibility and
1284 sunset of existing wireless connectivity, 2G, 2-1/2G and the
1285 sunset that is happening with the wireless providers there is
1286 creating a big issue for us where we already have Internet of

1287 Things systems in the field and we are having to replace
1288 those. It is a large expense.

1289 So as you think about moving forward what you want to do
1290 with the spectrum, I think it is important to consider
1291 backward compatibility and when and how those wireless
1292 systems sunset.

1293 Mr. {Lance.} Okay. Thank you very much to the entire
1294 panel. Mr. Castro, privacy oftentimes means different things
1295 to different people. Do you think the market is capable of
1296 addressing concerns related to privacy in the Internet of
1297 Things market over time?

1298 Mr. {Castro.} Yes. I think, you know, consistently
1299 what we see is when there is new technologies--and this goes
1300 back, you know, decades, centuries even--when new
1301 technologies come out, there are fears and doubt and
1302 uncertainty about the technology. But what we see is over
1303 time many of those issues are resolved just by the market,
1304 that you have this, you know, convergence between what
1305 business wants to do, what consumers want to have, and what
1306 government regulates. And a lot of these issues are worked
1307 out which is why in general I think we want this light touch
1308 approach. Especially it is important with the Internet of
1309 Things because so much of the innovation is around the data,
1310 and if you can't have companies sharing or reusing this data

1311 for lots of innovative purposes, this kind of long tail of
1312 innovation, you are not going to get this magnitude of
1313 benefits that we want to see.

1314 Mr. {Lance.} Thank you. Belkin has a close connection
1315 to consumers and access to very personal data. How has
1316 Belkin approached the privacy and security of consumer data
1317 in its product offerings?

1318 Mr. {Van Harlingen.} So Belkin takes privacy very
1319 seriously. Some of our products, you know, are very close to
1320 consumers, as you mentioned, including cameras and things
1321 like that. We work very closely on security, stay standard
1322 and ahead of the curve with industry standards. We have an
1323 application security team that is very active in the industry
1324 working with the Black Hat Community and other security
1325 researchers, and they are very thorough at reviewing our
1326 products, both before launch as well as after launch.

1327 Mr. {Lance.} Thank you. Mr. Chairman, I yield back 28
1328 seconds.

1329 Mr. {Burgess.} The chair thanks the gentleman. The
1330 gentleman does yield back. The chair recognizes the
1331 gentleman from Houston, Mr. Olson, 5 minutes for your
1332 questions, please.

1333 Mr. {Olson.} I thank the chair, and welcome to our
1334 witnesses. I want to follow up on my colleague's comments

1335 from California about manufacturing. As you all know, in the
1336 last decade, loss of good manufacturing jobs have left
1337 America and gone overseas. Many reasons, excessive taxes,
1338 excess regulations, but this appears to be the opportunity to
1339 bring things back to America with the IoT. So my question to
1340 you, Ms. Schooler, as one who has manufacturing as part of
1341 your business, you mentioned Germany, Brazil, and China.
1342 What are they doing that we are not doing? What can we learn
1343 from them and how can we make sure we have U.S. leadership to
1344 quote you in the future on the IoT?

1345 Ms. {Schooler.} Thank you. So one of the things that I
1346 noted was some of the advancements in the manufacturing
1347 capabilities in the IoT standards and national policy in
1348 other countries. If you look in areas like Germany, you will
1349 see some of the most highly automated, highly advanced
1350 connected factories in the world. I think there is a lot we
1351 can learn by going into some of these other geographies and
1352 understanding and leveraging some of the advancements that they
1353 have put into place up until now.

1354 If you look at places like China, they are highly
1355 adopting and supporting things like smart cities where they
1356 are using the technology, not only for manufacturing
1357 capability but also for societal positive impact by looking
1358 at the air quality as an example. We can look at use cases

1359 such as monitoring the health of an oil pipeline, all of
1360 these things, and a lot of it is around predictive
1361 maintenance. I think as we journey as industry over into
1362 these other geographies, understand the deployment
1363 capabilities that are in place. We need to bring that back
1364 into the dialogue that we are having on a regular basis, both
1365 with our other industry partners as well as government to
1366 continue to progress our policy to support some of the
1367 implementations of these technologies moving forward.

1368 Mr. {Olson.} I know there are at least two domestic
1369 groups that are looking at interoperability here in America
1370 and open standards. Is that enough? Should there be more?
1371 Who else should be involved in this? Because let us bring
1372 those jobs back.

1373 Ms. {Schooler.} Standards is an excellent point. We
1374 have the OIC and the IIC which I believe are the two---

1375 Mr. {Olson.} Yes.

1376 Ms. {Schooler.} --consortiums that you are inferring.
1377 One is the Industrial Internet Consortium and the other is
1378 the Open Internet Consortium. In both of those cases, you
1379 are taking very large members of industry, bringing them
1380 together to really set whether it be an architectural
1381 framework or series of test beds that allow for the
1382 understanding of the deployment. It is one thing to set

1383 standards. It is another thing to architect and build
1384 solutions based on those standards.

1385 So in both of those bodies you have not only the
1386 definition of the architecture but the deployment and the
1387 testing of the implementation of that architecture.

1388 So I think those are a good start. I think if you look
1389 from a connectivity perspective, you have efforts in 3GPP
1390 around 5G that are looking at IoT-specific use cases. We
1391 need to continue to put wood behind the arrow on the
1392 connectivity solutions as well. So I think we have a good
1393 start. I think as we continue through the commercial
1394 deployment phase, it remains to be seen as if it is enough or
1395 if we need to extend those standards' efforts further as we
1396 learn more through our initial commercialization efforts.

1397 Mr. {Olson.} Thank you. Mr. Castro, any comments, sir,
1398 on the issue of manufacturing, bringing it back to America?
1399 And Mr. Van Harlingen? Anybody before I get my time run out
1400 here?

1401 Mr. {Castro.} I think you are absolutely right. When
1402 we look at, you know, the opportunity here, the United States
1403 leads in this technology area, and we want to, you know,
1404 regain these manufacturing jobs. The way to do it is by
1405 investing and having the most innovative factories. And when
1406 we look--you know, the examples that I have in my testimony I

1407 submitted for the record, you know, we see U.S. companies
1408 leading in this space on the Intel, Harley Davidson,
1409 Raytheon, you know, these companies that are able to track to
1410 the turn of the screw what is going on in the factory and use
1411 that data to operate more efficiently than anyone else. That
1412 is our competitive advantage. We have to make sure we are
1413 investing in that opportunity. We have to make sure that our
1414 schools that are leading the development of this have the
1415 funding to do that, and that is one opportunity that Congress
1416 might be able to help support further.

1417 Mr. {Olson.} Mr. Harlingen?

1418 Mr. {Van Harlingen.} As a consumer electronics company,
1419 most of our focus is on consumer products. A lot of our
1420 manufacturing is done off shore, but we are constantly
1421 evaluating opportunities to bring manufacturing back on
1422 shore. There have been a couple of instances in some of our
1423 business areas where we have done so, and we are enthusiastic
1424 about doing so. We look forward to IoT technologies brought
1425 by other companies into the manufacturing sector to make that
1426 more possible and more practical for companies like
1427 ourselves.

1428 Mr. {Olson.} Well, come back to Texas. Mr. Morehead,
1429 your final thoughts, sir?

1430 Mr. {Morehead.} I am not as involved in the

1431 manufacturing side, but most of our vendors unfortunately do
1432 use off-shore partners. Where I see the opportunity, though,
1433 here is the fact that we are talking about 25 billion devices
1434 being implemented in the United States or some portion of
1435 that. You can't outsource the installation, activation,
1436 servicing, and redeployment of those devices here in the
1437 United States. So potentially retraining that workforce to
1438 get them intelligent and smart on how to maintain and install
1439 the devices could be another way to engage the workforce in
1440 the United States as opposed to just being dependent on the
1441 manufacturing.

1442 Mr. {Olson.} Thank you. Yield back. Out of time.

1443 Mr. {Burgess.} The gentleman's time has expired. The
1444 gentleman yields back. The chair recognizes the gentleman
1445 Mr. Mullin from Oklahoma for questions, 5 minutes, please.

1446 Mr. {Mullin.} Thank you, Mr. Chairman, and first off, I
1447 would like to thank the CMT staff for organizing the showcase
1448 earlier this morning and of course, all the participants. I
1449 was kind of blown away.

1450 One technology that was out there is brought to you by
1451 Al Sutherland from my state who shared the amazing technology
1452 that has already proven extremely useful to people like
1453 myself in the farming and ranching business. Mr. Sutherland
1454 has a product called the Mesonet where basically--and I hope

1455 I said that right--but basically it has a monitoring station
1456 in all 77 counties throughout the state. One of them is just
1457 located a couple miles from our place. It gives us real up-
1458 to-date information. He was demonstrating the app on the
1459 phone. I had that app downloaded real shortly, considering
1460 that this time of the year we begin to start burning off
1461 fields and then we enter hay season. It is very useful. In
1462 fact, I was very upset that I didn't already have it on my
1463 phone. It would have helped a few times laying that hay
1464 down. You can predict weather only so well. Well, it gives
1465 us some great technology.

1466 So it shows itself very useful out there. But there is
1467 been some fear around technology. There is this group of
1468 people out there that says, you know, it is going to
1469 eliminate jobs. And so for our panel, whoever wants to
1470 answer this, how do we combat that fear? You know, people
1471 automatically fear things that they don't understand. We see
1472 that all the time. But there is an argument being said that,
1473 look. If we go so far and we start continuing getting smart
1474 machines, our unemployment is going to rise. Go ahead,
1475 ma'am.

1476 Ms. {Schooler.} Yes, I think we need to continue to
1477 communicate the positive impacts that we see by doing things
1478 like the smart manufacturing use case that we talked about

1479 earlier. As I noted Intel implemented a smart capability
1480 within our own factory, and it provided a \$9 million savings
1481 in just one factory. And what was that savings based on?
1482 Equipment utilization rates, predictive and preventative
1483 maintenance, and for every time you institutionalize one of
1484 those learnings, you bring down product cost. You bring down
1485 product costs, you get more competitive on a world-wide
1486 basis, and you have the opportunity to bring jobs back to the
1487 United States.

1488 In those cases, I think we need to get much more
1489 aggressive in sharing those stories and sharing those
1490 learnings to balance out some of the fear and uncertainty
1491 that are put into the press around the other use cases where
1492 the news is very negative around job destruction.

1493 Mr. {Mullin.} All right.

1494 Ms. {Schooler.} I noted the data point earlier that in
1495 the January Accenture survey, 87 percent of the CEOs believe
1496 it is going to create new jobs. Mr. Morehead noted that,
1497 even in some cases if it is a consumer device and it is being
1498 manufactured off shore, these still need installed. There
1499 are still services. There are still new information-type
1500 positions that are going to be created. It may not be in all
1501 cases the types of jobs that we are used to today, but it
1502 will result in job creation moving forward. I am very

1503 passionate about that.

1504 Mr. {Mullin.} So how do we educate the people? Do we
1505 start putting these in trade schools? Do we start in high
1506 school? How do we implement it? And that is for anybody on
1507 the panel that wants to try answering this.

1508 Mr. {Castro.} I will jump in. I mean so, you know,
1509 there is myth that robots or automation kill jobs. I think
1510 part of that is an education problem that, you know, better
1511 economics lessons will teach people that, you know, if you
1512 look at the history--you know, I mean, if we want full
1513 employment, yeah, we can get rid of John Deere and all the
1514 tractors on farms and, you know, problem solved. That is not
1515 what we want to do. We want to lower prices for consumers.
1516 We want more efficiency. And most of the Internet things
1517 examples that we are talking about, they are addressing these
1518 issues. They are addressing, you know, productivity on
1519 farms. You look at safety issues, you know, automation with
1520 grain bins, you know, making workers safer. That is not
1521 eliminating jobs. That is actually improving quality of
1522 life.

1523 So I think once people start to see how this actually
1524 helps them, they are going to realize it is not technology to
1525 be feared but that technology improves their life.

1526 Mr. {Mullin.} Anybody else?

1527 Mr. {Van Harlingen.} So agreed. You know, this
1528 technology promises, like any new technology, it is going to
1529 bring change. Hopefully it will bring manufacturing
1530 opportunities back to the United States, and that will create
1531 jobs. But it is also going to create different types of
1532 jobs. As we mentioned in the service industry and things
1533 like that, I think it is going to be important to invest in
1534 education to prepare people for those new types of roles.

1535 Mr. {Mullin.} Thank you. I appreciate your time and
1536 once again appreciate the CMT putting this hearing together.
1537 Thank you. I will yield back.

1538 Mr. {Burgess.} The chair thanks the gentleman. The
1539 gentleman yields back. The chair recognizes Mr. Harper from
1540 Mississippi 5 minutes for questions, please.

1541 Mr. {Harper.} Thank you, Mr. Chairman, and thanks to
1542 each of you for being here today and really exciting to see
1543 the stuff on display this morning at the showcase, and I was
1544 obviously very happy to see Camgian Microsystems there which
1545 had a display on their new product, Egburt, so Gary Butler
1546 who started that. It is pretty remarkable what it does and
1547 can be used for a broad range of remote monitoring including
1548 the infrastructure help for say bridges and dams, and the
1549 future looks great for our country and to make sure that we
1550 have the innovation that we need and how we handle that, how

1551 we do it from Congress. So thank you for adding your insight
1552 to that.

1553 Mr. Castro, I know we discussed the governance aspect of
1554 this already, but within that Internet of Things, would there
1555 be a difference on that governance based upon the specific
1556 product or machines in that variance there? What would you--
1557 how would you comment on that?

1558 Mr. {Castro.} Absolutely. I think, you know, the
1559 traditional way that Congress has looked at a lot of data
1560 issues is industry specific. I think that is a very useful
1561 framework. And it, you know, differentiates us from Europe
1562 which has these broad-based privacy rules. And I think that
1563 is one of the reasons we were so much more successful I this
1564 space.

1565 But going forward, we should continue to do that. We
1566 should look. Are there areas where people have particular
1567 sensitivities? Maybe it is in education. Maybe it is in
1568 healthcare. We have different rules there, but we allow that
1569 same flexibility of sharing data throughout all of those
1570 sectors.

1571 Mr. {Harper.} And so should that governance even
1572 different within itself be different than other industries,
1573 let us say? Give me a little bit more meat on the bones for
1574 that.

1575 Mr. {Castro.} Yeah. So you know, it really depends I
1576 think on what the consumer harm is that we are trying to
1577 protect against. So for example, you know, a really good
1578 example that we have historically is discrimination against
1579 pregnant women when they go to apply for a job. You know,
1580 that is something that we don't want to have happen. So we
1581 restrict that use. It doesn't matter how you found that
1582 information out. It doesn't matter if it is accurate or not.
1583 It doesn't matter if you guessed it from, you know, using
1584 some kind of in-home smart system or you, you know, just saw
1585 someone walking down the street. The point is we regulate
1586 the use. And that is what we want to do. We want to look
1587 very clearly at what it is we don't want to have happen and
1588 make that illegal. And that provides consumers with
1589 confidence no matter where their data goes, or if there is a
1590 data breach, they are still safe.

1591 Mr. {Harper.} Well, what we want to make sure of from
1592 our end is we don't issue some regulation or enable some
1593 regulation that stifles innovation within the creative
1594 industry. And so that sometimes is a tough balancing act.
1595 But it seems to allow for more innovation if we get out of
1596 the way sometimes and don't create that roadblock at the
1597 beginning.

1598 Ms. Schooler, if I could ask you, do you see an overlap

1599 between consumer uses and enterprise or industry use of the
1600 Internet of Things?

1601 Ms. {Schooler.} I will respond to that in two factions.

1602 Mr. {Harper.} Okay.

1603 Ms. {Schooler.} I think from a privacy concern the use
1604 cases are very different. As Mr. Castro noted, I think the
1605 consumer privacy issues are going to need to have a specific
1606 type of set of considerations around how you share
1607 information, what personal information you share, versus in
1608 an enterprise implementation, you are really collecting,
1609 analyzing data within the confines of your own enterprise
1610 yourself. So I think those use cases will be very different.

1611 The area that I do think that we can leverage learnings
1612 is in security. I think if we look at security as a
1613 foundational element built in from the onset of
1614 implementation, there is a couple different vectors that we
1615 have to consider. One, you need to secure the device, the
1616 network, and the cloud because all are critical on-ramps into
1617 the Internet of Things. And if you only secure one of those
1618 assets and not the entire pipeline, if you will, I think that
1619 is an insufficient way to look at the architecture from a
1620 device to a cloud perspective. So that is one.

1621 Number two, I think we not only need to build in
1622 intellectual property into our silicon architectures and we

1623 are doing much of that at Intel, we also need to also build
1624 upon that software that monitors and manages those security
1625 concerns. The unique position that we are in at Intel is
1626 that we have both assets. So we are looking at how do we not
1627 only secure the device to the network to the cloud, how do we
1628 do it in silicon and how do we do it in software, such that
1629 we can create the most robust, secure, IoT implementation
1630 possible across consumer, industrial, and commercial
1631 implementations.

1632 Mr. {Harper.} Thanks to each of you, and I yield back
1633 the balance of my time.

1634 Mr. {Burgess.} The gentleman yields back. The chair
1635 thanks the gentleman from Mississippi. Seeing no other
1636 members wishing to ask questions, I do want to thank the
1637 witnesses and the members for participating in today's
1638 hearing. Before we conclude, I would like to include the
1639 following documents to be submitted for the record by
1640 unanimous consent: A letter on behalf of the Consumer
1641 Electronics Association.

1642 [The information follows:]

1643 ***** COMMITTEE INSERT *****

|
1644 Mr. {Burgess.} Pursuant to committee rules, I remind
1645 members they have 10 business days to submit additional
1646 questions for the record. I ask that the witnesses submit
1647 their response within 10 business days upon receipt of those
1648 written questions. I also want to take just a moment and
1649 thank the subcommittee staff for their hard work on the
1650 showcase this morning. I thought it was very informative and
1651 instructive, and without objection, the subcommittee is
1652 adjourned.

1653 [Whereupon, at 12:30 p.m., the Subcommittee was
1654 adjourned.]