The Internet of Things (IoT) is, well, the next big thing. To be sure, smartphones took us a long way toward our interconnected destiny, but the Internet of Things will take us to the end of the rainbow: a place where all our devices and belongings are smart enough to communicate with and instruct each other autonomously, and are even smart enough to adapt to changing conditions in the world around us. All in pursuit of making our lives better.

Or that is the hope. While many of the technologies needed to power the Internet of Things already exist, we still need these technologies—which range from embedded sensors to micro-electromechanical systems—to converge and work together seamlessly. We still have a long way to go before that happens and much to figure out before any mildly utopic IoT vision comes to fruition. Thousands of engineers and scientists around the globe are working to develop the tools needed to make our interconnected destiny a reality, driving a surge in efforts to obtain patent protection for IoT protocols, platforms, and systems. As that is happening and more connected devices hit the grid, important legal issues are already beginning to percolate at the intersection of law and the Internet of Things—questions that will challenge our notions of privacy, data ownership, and intellectual property. With some global analysts projecting that there will be one trillion Internet-connected consumer and industrial devices in use worldwide by 2025, the time to consider how the Internet of Things will affect the legal and patent landscape is not 2025, but today. Fortunately for us in the patent realm, we have some guidance and precedent to draw on from the last great (and fairly recent) tech revolution: smartphones.

In the discussion below, we take a deeper dive into the Internet of Things, consider what its growth means for the future, and explore how that growth may alter the patent landscape. We examine some of the IoT patents that have already issued, including several that are currently being litigated. Finally, we conclude with a reflection on lessons from the smartphone patent wars and how they may apply to IoT-related litigation in the future.

Our Interconnected Destiny
In the future, everything will be connected. Our refrigerators, our furniture, and even our clothing will send and receive data over the Internet. Yet other devices and applications will crunch our information in the cloud, leveraging individual and aggregate data to deliver products and services to consumers more effectively. Embracing this interconnected world will change the way we work, live, and learn, and promises to improve our lives in a variety of small ways with tremendous cumulative impact. A refrigerator that can tell when the milk is expiring and order a fresh carton for the household; a table that knows when some of its screws need to be tightened; a jacket that reminds you to bring an umbrella when it’s going to rain later. Small benefits, big impact. This is no far-off, science fictional future—advances in low-power electronics and sensor miniaturization make these (and much more ambitious) goals realizable in a matter of years, not decades. This is what the future the Internet of Things, also called the “programmable world,” promises us all.
As exciting as this sounds, the Internet of Things of today is as much concept as it is reality. It is the abstract construct formed by the union of all uniquely identifiable objects capable of sensing and communicating data in real time. If smartphones are just smart phones that do what we tell them, we can think of the Internet of Things as comprising all of the smart things in the world that can act on their own, even if they reside in different software ecosystems. A Fitbit counting the number of steps need not communicate with a Nest Thermostat, but both devices are part of the Internet of Things. (And while they may have no need to communicate, you can imagine why someone might want them to communicate: for example, to automatically set the thermostat a bit lower after a particularly long or arduous run.) Realizing our interconnected destiny requires more than having machines and sensors that can talk to each other without human intervention. It requires building new user interfaces, technologies, and data platforms; creating useful and robust communication protocols and standards; and overcoming limitations inherent in existing communications networks. If these types of innovations sound familiar, it is because scientists and engineers needed to do the same type of work to make the smartphone revolution happen. And in another parallel to the smartphone revolution, the IoT revolution will create immense value and opportunity for businesses to monetize through patents—and, of course, fight over.

Realizing “Unimaginable” Value
The IoT revolution will create new revenue streams and unique business opportunities for companies in all industries. Today, there are about six billion connected consumer devices in the world, but that figure is expected to explode over the next decade, driving a multitrillion-dollar annual market for the IoT. Press Release, Gartner, Gartner Says 6.4 Billion Connected “Things” Will Be in Use in 2016 (Nov. 10, 2015); see also Press Release, Gartner, Gartner Identifies the Top 10 Internet of Things Technologies for 2017 and 2018. Companies in all industries and sectors have raced to buy into the Internet of Things and its huge potential. IBM announced last year, for example, that it was investing $3 billion and tasking thousands of employees to form a new IoT business unit. Press Release, IBM, IBM Connects “Internet of Things” to the Enterprise (Mar. 31, 2015). Samsung’s CEO recently spoke of the “unimaginable” value in the IoT and declared that all of Samsung’s products would be Internet-connected by 2020. Interview by Samsung Newsroom with BK Yoon, CEO BK Yoon Emphasizes the “Unimaginable Value” of the IoT (Jan. 11, 2016). And just a few weeks ago, General Electric introduced broad IoT support for users to create customizable home automation tasks and notifications in all of GE’s smart appliances. Ashley Carman, “You Can Now Use IFTTT with GE’s Smart Appliances,” Verge, May 5, 2016.

The “unimaginable” value will not be anchored to product sales alone, however, but will flow from several sources: the development of more sophisticated data analytics services, overcoming technological hurdles associated with a communications infrastructure not designed to handle IoT devices and process IoT-driven data, and inventing new systems and solutions to make the IoT operate more seamlessly.

Data analytics. The rate of data creation, storage, and traffic has increased exponentially over the past decade. We generate about 2.5 quintillion bytes of data daily, enough to
ensure that more than 90 percent of all extant data in the world is no more than two years
old. See IBM, What Is Big Data?; Åse Dragland, SINTEF, Big Data—For Better or
Worse (May 22, 2013). The immense amount of user data generated by connected,
sensing devices can be tracked, aggregated, parsed, and analyzed to reveal use patterns,
as well as consumer trends and habits. Studying those data will help companies make
more attractive and even better products. In certain circumstances, companies will be able
to sell IoT data to “big data” outfits with even more sophisticated analytic and pattern-
detecting capabilities.

Adapting the pre-IoT infrastructure. There is also value in developing the tools
necessary to overcome technological limitations of the pre-IoT world. Just a few of the
factors that will drive innovation and open the door for new patents in the IoT space are,
for example, limitations in the existing wireless communications infrastructure
(particularly over cellular data networks, which are not accustomed to transmitting weak,
ultra-low power signals); the absence of any unified communication, application, or
services platform for IoT devices; and the difficulty of harmonizing disparate security
controls across communicating devices.

Making it better. As is the case when any technology in its early stages, companies
operating in the IoT space will want to invent new systems and protocols to make IoT
devices work better and faster and be more secure. We have already seen companies like
Amazon, Microsoft, Cisco, and Hewlett-Packard deploy IoT platforms for managing
different connected devices. In the chip-making industry, Intel has taken the lead in
advocating Open Interconnect Consortium standards, challenging Qualcomm’s AllSeen
Alliance to launch “universal” communication standards between IoT devices. That few
if any of these standards are compatible with one other has not dissuaded companies and
organizations from trying to stake out what will be an incredibly lucrative landscape.

These disparate and new revenue sources further distinguish IoT and connected devices from
more traditionally profitable consumer gadget lines like TVs and smartphones, for which
innovation has plateaued recently. Making more “smart” devices, leveraging the data from those
devices in creative and useful ways, overcoming pre-IoT limitations, and inventing the systems
and methods to make IoT devices work more seamlessly and securely will create countless
opportunities for new revenue streams—which are likely to go hand-in-hand with efforts to
secure corresponding patent protection.

IoT Patents in the Wild
The magnitude and sweeping nature of the Internet of Things, coupled with the tremendous
market value and potential, means that there will be patents—many patents. Already, we are
seeing patents relating to IoT technologies that touch on a broad range of disciplines: device and
sensor software, hardware, network connectivity and communications protocols, data security
and encryption, power management, data analytics, user interfaces, and user applications, to
name a few. According to a 2014 report by the United Kingdom’s Intellectual Property Office,
“[t]he worldwide dataset for IoT patents published between 2004 and 2013 contains almost 22,000 published patents equating to almost 10,000 patent families.” UK Intellectual Prop. Off., *Eight Great Technologies: The Internet of Things* (2014). During the same time period, IoT-related patents and applications increased more than 40 percent each year, compared with an average 6 percent annual increase for all other technologies. This is partially due to the fact that IoT technologies tend to be industry-agnostic, and thus a broader range of companies have been seeking patent protection for IoT-related inventions. The surge in IoT-related patents over the past decade is likely to intensify.

Some newer U.S. IoT patents shed light on the shifting tech landscape. For example, Apple holds a patent entitled Local Device Awareness, which is directed to autonomously operating an electronic device to find and determine an identity of other close-range devices. U.S. Patent No. 9,137, 254 (issued Sept. 15, 2015). The technology could be used for things like relative position tracking or automatically facilitating a connection between a smartphone and a nearby projector. In related patent applications, Apple seeks to claim a system for location-based home device automation (e.g., turning on lights based on the location of a mobile device) and geofences. *See* U.S. Patent Application Nos. 14/542,800 (filed Nov. 17, 2014), 14/180,731 (filed Feb. 14, 2014).

Other major industry players like LG Electronics, Samsung, Qualcomm, and IBM (which, incidentally, happens to hold four of the first five U.S. patents to issue with the phrase “Internet of Things” in the title) have also been actively expanding their IoT patent portfolios. *See* LexInnova, *Internet of Things: Patent Landscape Analysis* (Nov. 2014; updated July 2015).

According to the LexInnova report, the distribution of IoT patents is not consolidated in any one dominant player but “very fragmented with the top filer having around 5% of the total [IoT] patent filings.” *Id.* In addition, the report observes that some prominent nonpracticing entities like Interdigital and ETRI have also sought IoT patents, suggesting “that there are high chances of much patent litigation in this domain in future.” *Id.*

The future is now, apparently, because IoT patent litigation is already well under way. One area in which IoT patents are currently being litigated is wearables. For instance, in February 2014, Adidas sued Under Armour for allegedly infringing several patents relating to systems and methods that propose fitness routes (e.g., jogging routes), track and display user performance data and location, and enable users to share fitness activity information over the Internet. *Adidas AG v. Under Armour Inc.*, No. 14-cv-0130 (D. Del. filed Feb. 4, 2014). A year later, Adidas and several other apparel makers found themselves on the receiving end of a lawsuit brought by Sarvint Technologies, a small Georgia company that accused the defendants of making apparel that infringed U.S. Patents 6,381,482 (Fabric or Garment with Integrated Flexible Information Infrastructure) and 6,970731 (A Novel Fabric-Based Sensor for Monitoring Vital Signs.). *Sarvint Techs. v. Textronics., Inc.*, No. 15-cv-0073 (N.D. Ga. filed Jan. 9, 2015). Even though wearables constitute a small fraction of the much bigger Internet of Things, these lawsuits over fitness and activity trackers presage the wider patent war to come, as IoT technologies mature and develop and as more IoT devices are sold in the market.
But IoT patents—particularly those that focus on sensing and transmitting data across platforms—are likely to face even stronger challenges in litigation than some smartphone patents. Many of these challenges will question whether the subject matter is even eligible to receive patent protection under 35 U.S.C. § 101 and Alice Corp. Pty. v. CLS Bank International, 134 S. Ct. 2347 (2014). Anyone hoping to stake out some of the “unimaginable” value in the Internet of Things through a robust patent portfolio should heed the Federal Circuit’s words in Ultramercial, Inc. v. Hulu, LLC: “Any transformation from the use of computers or the transfer of content between computers is merely what computers do and does not change the [patent eligibility] analysis.” 772 F.3d 709, 717 (Fed. Cir. 2014).

The significance of section 101 challenges in the IoT space is already becoming apparent in perhaps the most expansive and high profile of the early IoT patent battles, the battle being waged between Jawbone and Fitbit. The litigation, which has been acrimonious and harks back to recent memories of the battles between Apple and Samsung, began in mid-2015 but is now in full swing. In May 2015, AliphCom (doing business as Jawbone) and its subsidiary BodyMedia sued Fitbit in state court for, among other things, allegedly “systematically plundering’ confidential information by hiring Jawbone employees who improperly downloaded sensitive materials shortly before leaving.” Michael J. de la Merced, “Jawbone Accuses Fitbit of Stealing Information by Hiring Workers Away,” N.Y. Times, May 27, 2015. Less than a month later, Jawbone sued Fitbit in California federal court for allegedly infringing patents related to tracking health data. AliphCom v. Fitbit, Inc., No. 5:15-cv-02579 (N.D. Cal. filed June 10, 2015). And less than a month after that, in July 2015, Jawbone filed a complaint requesting that the International Trade Commission (ITC) commence a section 337 investigation into Fitbit’s alleged infringement of six asserted patents. Most recently, an ITC judge issued an initial determination finding that Jawbone’s patents were patent ineligible under section 101 and Alice. Certain Activity Tracking Devices Systems and Components, Inv. No. 337-TA-963 (Int’l Trade Comm’n Apr. 27, 2016).

In language likely to instill fear in the hearts of patentees in the IoT space, the administrative law judge (ALJ) explained that using “conventional electronic devices to obtain and manipulate sleep-related data of an individual is an abstract idea bereft of any innovative technological concept. . . . This type of information can be and has been collected and recorded by human minds and hands.” Id. at 12–13. The ALJ described the act of gathering health data as just another “method[] of organizing human activity” (id. at 13), reminding us that many of the fantastic measurements and tasks IoT devices will someday seamlessly take and perform are, in fact, nothing that hasn’t been done for ages. Indeed, the ALJ recounted the story of seventeenth-century English diarist Samuel Pepys to illustrate the point:

Human beings have recorded their sleep patterns for ages. [Pepys] began nearly every entry with the observation that he was “up betimes.” . . . Pepys recorded this fact using quill and paper, and he passed it on to generations of readers over the centuries by means of print media. [But] [e]ven assuming that Pepys were the first person on earth to invent the idea of organizing the events of his life and recording them in a diary, Pepys would
not be permitted under *Alice* to patent his system so as to preclude others from using a quill and paper to record, for example, the time they awoke each day. Moreover, if Pepys used a ball point pen to record his diary entries more quickly and easily than with his quill, he still could not patent his system of organizing and recording the events of his daily life by writing them down on paper, so as to compel other diarists to pay him when they recorded, using a ball point pen, the time they awoke. It follows that, even if Pepys owned a unitary, wearable housing containing electronic components that could organize the events of his daily life and enable him to blog on the Internet that he was “up betimes” (which is exactly the sort of thing Pepys would do), he still would not be allowed under *Alice* to obtain a patent to exclude others from using computers to organize, record, and transmit data about their own sleep habits. . . . Jawbone did not invent any of the means for monitoring sleep recited in the patent, and Jawbone cannot patent the idea of monitoring sleep using those means.

*Id.* at 14–15.

Jawbone tried to salvage other, more specific dependent claims, such as one claim that covers the additional step of providing suggestions to the user based on parameters and information derived from the gathered health data. But the ALJ was unswayed, concluding that even a “human being monitoring health status using conventional sensors also can make suggestions based on such information.” *Id.* at 23. Having found nothing but abstract concepts in the two patents at issue, the ALJ turned to the second part of the *Alice* test and tried to find an inventive concept that would transform the abstract into patent-eligible subject matter. However, the ALJ found no such inventive concept in the patents, explaining that “[t]he generic, off-the-shelf components included in the . . . patent’s system lack any inventive aspect.” *Id.* at 20.

The ALJ’s ruling in the ITC proceeding is far from the final word on section 101 patent eligibility for IoT devices, but it would be foolish to write it off for that reason. Much of the “magic” of the Internet of Things sits atop existing technologies, processes, and networks, and many of the advances that move us toward our interconnected destiny will come from making those existing technologies work together well. As the patent landscape for the Internet of Things evolves and develops and as IoT portfolios expand, attorneys should be careful to advise their clients that *Alice* may have even more teeth in the IoT space than in any other technological field.

**Learning from the Smartphone Patent Wars**

Revolutions often cause wars—this is as true in commerce as it is in geopolitics. As we look ahead to how the IoT revolution will change the patent landscape, we should also look back at the last great tech revolution for key parallels, patterns, and lessons. It was not so long ago that the smartphone revolution put communication devices with the wealth of human knowledge at our fingertips. In the span of a few seconds, you can check on your kids, catch up on the news, and settle a bet over Ptolemy’s first name (Claudius, by the way). It should come as no surprise that the technologies needed to make this modern miracle happen were covered by a multitude of
patents of every stripe: hardware, software, communications, user interface, input/output, and icon design, to name a few. The biggest smartphone makers saw the revolution coming and had invested heavily and steadily in their patent portfolios, mainly as a defensive risk-mitigation measure. In 2009, two years after Apple first wowed the masses with the “magical” iPhone, the first shot of the smartphone patent wars was fired—against Apple, as it happens. Saul Hansell & Kevin J. O’Brien, “In Lawsuit, Nokia Says iPhone Infringes Its Patents,” N.Y. Times, Oct. 22, 2009. Apple countersued, and the rest, of course, is history: In just a few years, the top 10 smartphone makers were litigants in thousands of patent lawsuits. Smartphone makers had to accept that patent litigation was just another cost of making and selling smartphones, even if it was only a small component of their product that arguably infringed a valid patent.

The lessons of that history should not be lost on us as IoT technologies develop and more IoT patent disputes arise. In the smartphone patent wars, we saw what happens when a fragmented industry used multiple converging technologies to make an attractive smartphone. Each smartphone component from the touchscreen to the operating system could have thousands of its own subcomponents, any number of which could fall within the scope of patents covering one or more smartphone features. Because smartphones are incredibly complex machines merging numerous technologies, it was difficult for smartphone makers to conduct thorough pre-launch patent clearance searches for each and every feature and component of their products. IoT devices present the same problem on an even broader scale. Companies making IoT devices exist across all industries, and IoT products, like smartphones, work by bringing together a broad range and variety of technologies, components, and subcomponents.

Other trends in the smartphone patent wars demonstrated the significance of standards setting. In the IoT area, many standards already exist or are under development. Some are being spearheaded by standards-setting organizations, such as the International Society of Automation, which is working on establishing the ISA100 Wireless standard to provide an industrial network protocol compatible with IoT. Others, however, are being developed as proprietary standards not likely to be compatible with other proprietary standards. As the IoT protocols and platforms begin to settle around one set of optimal standards and as patents issue to cover features associated with certain standards, expansive patent litigation is likely to follow. And, as we saw in the smartphone patent wars, parties that seek to enforce patents that cover a standardized technology, i.e., a “standards-essential” patent, may need to license the patent on fair, reasonable, and nondiscriminatory terms.

Perhaps the most significant lesson from the smartphone patent wars is the simplest: A war may not be worth waging if no one wins. Years after Steve Jobs described Android as “a stolen product” and vowed to spend every penny of Apple’s money to wage “thermonuclear war” against Google’s Android operating system, smartphone companies have learned that litigation does not move at the speed of technology, and amassing strategic patent portfolios does not necessarily translate to a strategic real-world advantage. Some may recall that Judge Richard Posner, sitting as a trial judge in federal district court, remarked in a 2012 decision that neither Apple nor Google should win the patent case against each other. Judge Posner reasoned that no
reasonable economic actor would engage in extensive, expansive patent litigation over various “smart” device features as opposed to negotiating cross-licensing deals. Although the Federal Circuit would later reverse Judge Posner’s decision, his reasoning was vindicated when Apple and Google agreed to settle their dispute in mid-2014.

Commentators are still debating these and other lessons learned from the smartphone patent wars. The key takeaway is that securing a vast IoT-related patent portfolio and aggressively asserting that portfolio may not have the desired effect. It is to be hoped that IoT litigants will not need to relearn all of these lessons through another costly and time-consuming patent war.

**Conclusion**

Regardless of whether you believe the Internet of Things will make all our lives better, happier, and easier, there is no question that the technology is maturing and spreading rapidly. New innovations and technologies mean new patent rights—and, unlike the smartphone patents, which tended to be concentrated in one (concededly massive) industry, IoT patents are likely to spring up from unlikely corners of the global market. Whether those patents will survive the flurry of section 101 attacks remains to be seen. It is also unclear whether companies will unwittingly slip into the types of patterns we saw during the smartphone patent wars or will heed the Posnerian logic and seek “rational actor” cross-licenses more readily. What is certain is that the Internet of Things is here, and it will change everything.

**Keywords:** litigation, intellectual property, Internet of Things, patents, IoT

Peter H. Hanna is a senior associate at Jenner & Block LLP in Chicago, Illinois.