

PLAYING TAG

An RFID Primer

K. Lloyd Billingsley

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Pacific Research Institute
755 Sansome Street, Suite 450
San Francisco, CA 94111
Tel: 415/989-0833 | 800/276-7600
Fax: 415/989-2411
Email: info@pacificresearch.org

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The new technology rolled out to great fanfare from promoters and corporate customers. But among activists on both the left and the right, warning lights were flashing and sirens blaring. This new technology, some of the activists said, was nothing less than the mark of the beast, a harbinger of the apocalypse. Others warned that it would empower Big Brother to keep all citizens in line. Television talk-show hosts, meanwhile, solemnly advised their audiences that the new high-tech gear would enable grocery stores to trick customers. Food and freedom stood in peril, and it doesn't get much worse than that. Something had to be done, and legislators needed to take up the cause.

Such was the response to the bar code, a technology that has become virtually universal, with no sign that the sky is falling. Instead, bar codes have saved retailers countless billions of dollars and have resulted in faster service, not price trickery, for consumers.

A similar scenario is playing out with RFID, a new technology that has a far wider range of benefits than the bar code, but which has activists sounding the alarm and legislators, state and federal, rushing to the rescue. At this writing, the European Union is considering privacy and security guidelines for RFID. In America, some key states already have or are currently considering legislation affecting RFID, and some members of Congress are becoming agitated about this technology.

There are legitimate reasons why new technologies spark fear, but there are ways to allay that fear without succumbing to regulatory libido. Further, it is not entirely accurate to call RFID new.

What is RFID?

RFID stands for radio frequency identification and has antecedents in the transponders developed by the British as far back as the late 1930s to distinguish between friendly and enemy aircraft. Others more warily see precursors in the passive listening devices developed by the Soviet Union in the mid-1940s. In the late 1940s, scientists worked on communication by means of reflected power. By the early 1970s, reflected-power devices had found a common application as toll takers. In 1973, the passive radio transponder with memory appeared—a milestone in the development of RFID.

In current applications for RFID tags, tiny microchips field radio signals and respond with their code. The item in which the tag is embedded does not have to be held up to a scanner as with bar codes. Rather, it can be read remotely, which delights retailers but disturbs some privacy advocates and civil libertarians. It can also be implanted in the human body, a prospect

that has provoked apocalyptic warnings. In the more common passive applications, the RFID tag needs no batteries and can be as small as half a grain of sand. Tags made for rarer active applications can store more information but are larger and more expensive, and their lifespan is limited to the life of the battery.

Passive RFID tags currently cost about 20–25 cents, but the goal price is less than five cents each. Early RFID readers cost well into the thousands, but by 2003 some were available for less than \$150.¹

The EPC, or electronic product code, is the new coding system being developed to identify individual products using RFID technology. Guidelines for companies using products with EPCs on a large scale are administered by EPCglobal, a joint venture between EAN (European Article Numbering) International and the Uniform Code Council.

Using RFID tags makes for retail efficiency. Wal-Mart, the pioneer in this field, has already enjoyed great success with the technology, which it started using in early 2005. According to Wal-Mart officials, the use of RFID has allowed the company to replenish out-of-stock items three times as fast as before and reduce by 10 percent the number of out-of-stock items that must be manually ordered. Such savings can be passed on to consumers in the form of greater discounts.

In addition to the efficiencies RFID provides for retailers, it also spells convenience for consumers. In the future, RFID could eliminate the need for swiping a card at the checkout counter. Instead, customers could simply walk their shopping carts through the gate. RFID could also speed the often time-consuming process of returning goods to a retailer. RFID could inform a retailer that the shelf life of a particular item was about to expire, and could monitor the temperature of products in delivery trucks. The technology can be used in places where bar codes are not practical, in extreme temperatures and rough conditions.

What RFID Can Do

RFID benefits extend far beyond retail. For starters, there is great potential in the medical field. An RFID tag can act as the modern equivalent of a medical bracelet. In addition to information such as the bearer's name and address, the tag can contain data such as blood type, allergies, and doctor's name and contact information. It could save a life if an ill or injured person were to be unconscious by the time she was brought to a hospital. Indeed, Joseph Krull, an executive at Virtual Corporation, which produces RFID tags, has had such a chip implanted in his arm.

Besides its potential contributions in retailing and medicine, RFID technology has major implications for agriculture. Digital Angel, a company that makes implantable RFID chips, has been awarded a patent for its BioTherm temperature-sensing tag, which can monitor the body temperature of its host animal, such as a cow or a chicken. If the chip alerted the farmer that one of his chickens was suddenly displaying a high temperature, the farmer could take action before the ailing chicken infected others. RFID technology can also account for farm animals in the field, trace pets that get lost, and track animals in the wild. It could even help stop the spread of bird flu before it becomes an epidemic.

RFID can be used for security applications. Third Eye, Inc., offers a device—not implanted but worn in a wristband—that monitors heart rates. Suppose the manager of, for example, a bank or a casino, looks at a screen where RFID information is displayed and notices that an employee suddenly has an elevated heart rate. The manager can quickly investigate whether the employee is involved in an emergency situation. The Japanese use RFID to monitor truancy.

The technology can play a role in forest management, tracking both the growth of trees and their health. The RFID tracking function can be used with library books, airline baggage, beer kegs, and an endless array of inventory on pallets. The military uses it to track parts and munitions in its vast supply system. Toll booths use it for fast-track systems that help avoid traffic tie-ups. ExxonMobil's Speedpass boasts some seven million users.

RFID can help curtail criminal activity. Ford's tag-in-key system, based on RFID technology, helps prevent car theft. RFID can identify counterfeit products, including bogus pharmaceuticals, which can prove dangerous or even fatal. The U.S. government is considering implanting RFID tags in currency, in order to foil counterfeiters. RFID can curtail shoplifting and in-store pilferage by employees, which result in an annual loss in the billions and punishes retailers and consumers alike.

In 2006, the U.S. State Department began rolling out "e-passports," high-tech documents that bolster border security through identity safeguards. E-passports employ RFID tags, which the State Department calls "contactless integrated circuits."

Embedded in the back of these “next gen” passports, the tags duplicate the personal information printed in the passport: name, birth date, passport number, address, and a digitized photograph. The tags will be scanned by U.S. customs officials to validate the printed information and thereby make it harder for fraudsters, illegal immigrants, and terrorists to enter American territory. At a time when fake Social Security cards and driver’s licenses can be bought on the street for a few hundred dollars, toughening the nation’s most important identity document is a good start for improving border control.

Major RFID Players

Wal-Mart, the nation’s largest retailer, has been the flywheel driving the rollout of RFID technology. In 2003, the company notified its top 100 suppliers that they would have to install RFID tags on all cases and pallets by January 1, 2005; the remaining 12,000 suppliers would have to adopt the tag technology by 2006. In addition to the top 100 suppliers, 37 others voluntarily committed to the 2005 deadline. This mandated adoption by Wal-Mart is likely to have the same far-reaching industry effect as the corporate giant’s similar decision to adopt barcode technology in the early 1980s.

Gillette, one of Wal-Mart’s top 100 suppliers, was one of eight select suppliers that placed RFID tags in some products for use in a Dallas–Fort Worth Wal-Mart pilot test in 2004. The other seven were Hewlett-Packard, Johnson & Johnson, Kimberly-Clark, Kraft Foods, Nestlé Purina PetCare Co., Procter & Gamble, and Unilever. In 2003, Gillette purchased half a billion RFID tags for use in its products, the largest recorded purchase of RFID tags to date.

The other major player is the United States Department of Defense (DoD). The DoD, which manages the world’s largest warehouse network, committed its suppliers to adopting RFID technology to track supplies for all military branches by January 2005. The DoD thinks the tags fit the mantra of the 21st-century U.S. military: lighter, faster, more efficient. The tags could help get troops the equipment they need more quickly, cut waste in ordering, and allow for more efficient deployments during crises. In turn, the military’s commitment to RFID is a boon to the industry, as there are thousands of military suppliers with countless products that can be tagged.

Big Brother in Small Packages?

As these examples show, RFID has the ability to monitor goods, animals, and people individually. While that provides many advantages, it has given rise to some legitimate concern. Any technology can be abused, and it would be naïve to pretend that RFID is immune. Some of the concern, however, might stem from hostility in certain quarters to big business—embattled Wal-Mart in particular—and the U.S. military.

The concealment made possible by grain-of-sand miniaturization, coupled with remote scanning ability, raises the specter of a full-time surveillance society. That disturbs groups from many points on the political spectrum. The most militant opponents of RFID technology include the American Civil Liberties Union and CASPIAN, Consumers Against Supermarket Privacy Invasion and Numbering, which describes itself as a “grass-roots consumer group.”

These and other opponents of RFID worry that the police and other government agencies could install RFID scanners in public places and track people through their purchases. Items resold or given as gifts could identify an individual’s social network. RFID tags could be matched with a credit or ATM card for additional data collection. Libraries could use RFID for patron profiling in the post-9/11 world.

Journalist Declan McCullagh raises the possibility of “nightmare legal scenarios that don’t involve the cops.” One party in a divorce case, for example, could seek a subpoena for RFID logs to prove that the spouse was in a certain location at a certain time.² McCullagh is not an alarmist, and he values the advantages RFID provides to retailers and consumers. Even these advantages, though, provoke objections.

Shoppers may be unaware that they have purchased products bearing the tags, which could be scanned without their knowledge, permitting retailers to contrive sales pitches based on the contents of a shopping cart or the items customers are wearing. Store managers could use RFID to monitor the movements of shoppers within the store and change store layout and product placement accordingly. The prospect of currency with RFID tags could mean that even those who avoid paying by credit card would not be immune from profiling.

Those scanning the tags need not be limited to government snoops, police profilers, or eager retailers. The world of high technology has handed thieves new opportunities. They could scan houses, shopping bags, wallets, and purses—even the trash—to determine the value of an owner’s belongings or the amount of money he is carrying. This type of market research by thieves, interestingly, disturbs privacy advocates less than uses by government and business.

Even passport tags have their naysayers. The main concerns are terrorists “skimming” crowds to identify and target Americans, and terrorists or criminal elements corrupting the wireless technology to slip through our borders undetected. During a demonstration at a hackers’ conference in Las Vegas, a security consultant showed how digital information from a German e-passport’s RFID tag could be read and copied, stoking a firestorm in the American media. Any potential problems with e-passport RFID could have global ramifications, since nearly 30 other countries have joined the United States in an international push to upgrade passports in the battle against terrorism and crime.

All these objections, while they touch on valid areas of concern, ignore the limitations of even “smart” technology. An RFID tag, though a marvel of technological ingenuity, can’t tell the reader if the item is being worn by the purchaser of the product, if it has been acquired by another party, or if it is tossed in the trash. And consumers can simply cut off RFID tags placed in hangtags on clothing.

Surveillance through photographs and video footage, widely employed in retail and government facilities, remains more effective than RFID for many purposes because it can identify individuals where RFID remains effectively blind. Companies seeking to build profiles on customers can use data from payment cards, loyalty cards, and bar codes. For their part, companies are interested in efficiency not for its own sake but because of its positive effect on their bottom line. They are unlikely to invest in tags that only load them down with surplus information. That is why the bar code will continue to be used.

At present, it is difficult to make an RFID tag completely undetectable to a consumer. In addition, the tags can be permanently deactivated with a “kill command.” The equipment to execute this command could be installed at the checkout counter or in a separate kiosk, enabling consumers to disable the tags. For thieves to detect RFID tags in homes, they would have to invest in high-powered scanners, and they would need the ability to decipher EPC serial numbers. Criminals would likely continue to use cheaper and more effective ways of determining the contents of a home, such as scamming their way inside.

As for the demonstration at the hackers conference, RFID industry experts were quick to point out that it proved little, if anything. Even if a terrorist were somehow able to crack the RFID code on an e-passport, copied RFID data could not be changed. Since the data include a digital photograph of the original passport bearer, it’s unlikely the passport information would be useful to a thief. Any attempt to change the user data could be detected by passport-control officials.

Additional safeguards have been added to the e-passport design to maintain the integrity of the RFID tag. New passport covers are shielded with metallic thread so that the radio tag can

be read only when the back cover is open. Even then, the passport must be directly facing the scanner from a distance of no more than four inches.

As for the possibility of terrorists using RFID tags to identify Americans and other westerners, the same limitations apply to terrorists as to thieves. Furthermore, they have not needed RFID technology in the past to find embassies, tourist hotels and restaurants, and other hot spots for foreigners. Dress, behavior, and language give away foreigners much more readily than RFID tags in merchandise or passports.

Legislative Notes

With broad capacities and potential abuses, RFID was bound to draw legislative attention. A flurry of activity over RFID began around 2004, just after Wal-Mart got serious about the use of RFID tags. As of last year, 12 states had legislation pending to restrict or regulate RFID, and Congress was also taking notice. So were some federal agencies: the FDA wants pharmaceutical companies to use RFID to fight counterfeiting.

In February of this year, Republican Senators Judd Gregg (New Hampshire) and Gordon Smith (Oregon) introduced the Safe Internet Pharmacy Act of 2007. The bill requires that shipments from drug companies contain markings confirming that the shipper is licensed; such markings could include technologies capable of tracking and tracing. At this writing, the Safe Internet Pharmacy Act has been referred to the Senate Committee on Health, Education, Labor, and Pensions.

In March, Democratic Senator Edward Kennedy (Massachusetts) and Representative Henry Waxman (California) each introduced bills labeled the Family Smoking Prevention and Tobacco Control Act. These bills would allow the government to require tracking devices on tobacco packages. The bills do not specifically mention RFID technology, but it would suit this purpose. The bills were introduced on March 17 and are expected to pass later this year. Senator John Cornyn (R-Texas), a sponsor of the legislation, is co-chair of the Senate RFID Caucus.³

An earlier federal law, the REAL ID Act of 2005, mandated that states must redesign driver's licenses by 2008 to include technology readable by machines. And several states are considering RFID legislation of their own, particularly California, which often sets the trend for other states.

In 2004, State Senator Debra Bowen, a Democrat from Los Angeles County, introduced SB 1834, which would have set privacy standards for RFID. Specifically, under this bill, businesses and libraries would have been prohibited from using RFID to collect information from items a customer took from the shelf but then put back before making an actual transaction. The bill would have also banned collection of information from tags on clothing and in purses. The measure passed the state Senate but failed to emerge from the Assembly's Committee on Business and Professions.

In 2006 State Senator Joe Simitian, a Democrat from Palo Alto, authored the Identity Information Protection Act (IIPA), hailed by some privacy advocates as model legislation for all states. The measure would prohibit new use of RFID tags, which it called "contactless integrated circuits," in identification documents issued by local or state government agencies. It would also require government agencies to provide written notice about existing RFID tags to people given documents containing them. Scanning an RFID tag without the holder's knowledge would be punishable by a \$5,000 fine or a year in prison.

IIPA was introduced as SB 768, and it passed the Senate and the Assembly. Governor Arnold Schwarzenegger vetoed SB 768 on September 30, 2006, explaining in his veto message:

SB 768, which would impose technology regulations on RFID-enabled ID cards and public documents, is premature. The federal government, under the REAL ID Act, has not yet released new technology standards to improve the security of government ID cards. SB 768 may impose requirements in California that would contradict the federal mandates soon to be issued.

In addition, this bill may inhibit various state agencies from procuring technology that could enhance and streamline operations, reduce expenses and improve customer service to the public, and may unnecessarily restrict state agencies. In addition, I am concerned that the bill's provisions are overbroad and may unduly burden the numerous beneficial new applications of contactless technology.

Senator Simitian remains undeterred. His SB 30, the Identity Information Protection Act of 2007, would institute specific requirements for devices that use radio waves to transmit data. The Senate Judiciary Committee sent the bill to the full state Senate on March 13, 2007. Senator Simitian's SB 31 would prohibit the remote reading of identification devices without a person's

consent; doing so would be a criminal act, punishable by fine or imprisonment. This measure also passed the Judiciary Committee on March 13.

The senator's SB 28 would prohibit the Department of Motor Vehicles from issuing, renewing, duplicating, or replacing a driver's license or identification card if the license or card uses radio waves either to transmit personal information remotely or to enable personal information to be read from the license or card remotely. The Senate Transportation and Housing Committee approved the bill on March 27, 2007. Earlier in March the Senate Education Committee approved SB 29, also by Simitian, which would prohibit for three years the use of RFID devices to monitor or record the presence of students in public schools. This bill passed the Senate on April 16 and was sent to the Assembly. Requiring, coercing, or compelling an individual to undergo "subcutaneous implanting" of an identification device would be prohibited under Simitian's SB 362. This measure was heard in the Appropriations Committee on April 23.

SB 388 was introduced by Democratic state senator Ellen Corbett in late March. It would require any person or entity using RFID tags to provide specified information to the recipient. Aggrieved parties could bring damage actions against violators.

Other states are also getting into the act. Indeed, Wisconsin actually preceded California in enacting RFID legislation: a 2005 bill introduced by Democratic Representative Marlin Schneider bars the forced implantation of RFID devices under the skin. In March 2007, Schneider introduced a bill to prohibit RFID tags in U.S. currency or other documents.

In 2004, Utah representatives approved a Frequency Identification Right to Know Act (HB 251), which would have required customer notification of RFID tags. Retailers opposed the measure, and it failed to pass the Utah Senate. In May of 2006, New Hampshire passed a bill calling for a commission to study the uses of RFID and their various implications.

In Washington State this January, Democratic Representative Jeff Morris introduced House Bill 1031, the Electronic Bill of Rights, which would require consumer consent for the use of RFID to collect information. A number of companies wrote to the Washington House of Representatives to oppose the measure. It did not make it to the House floor by March 14 and therefore will not be heard by the full Washington House this year. SB 6020, a bill by Democratic Senator Darlene Fairley, would require conspicuous labels on products with RFID tags. That measure is now being considered by the Washington Senate's Consumer Protection and Housing Committee.⁴

At this writing, RFID legislation is in play in a number of other states, including New York and Missouri. Readers can follow developments in *RFID Journal* and in the RFID Law Blog of McKenna Long & Aldridge, a law firm that focuses on public policy and technology.

Conclusion: "This issue is going to come down to market forces."

RFID is a useful technology already enjoying multiple applications, which are certain to expand. That a new technology sparks fear is understandable, especially a device so small that it can be placed under the skin and used to track the bearer. Some who are concerned about RFID do not want to ban the technology but ask for simple rules for tag placement and use. Declan McCullagh, for example, urges that consumers be notified of RFID tags in merchandise they buy, and that the tags be disabled at the checkout counter after the purchase is completed. McCullagh also recommends that tags be embedded in the packaging, not in the product, and that they be readily visible and easily removable. "Given RFID's potential for tracking your every move," he says, "is that too much to ask?"⁵ Probably not, and McCullagh received assurances from Wal-Mart that it indeed plans to disable the devices at checkout.

However, it is a stretch to say that RFID tags can track "your every move." As noted above, a scanner cannot tell whether a product bearing a tag is being used by the purchaser of the product, has been given to someone else, or lies in the trash. There can be little doubt that much of the anti-RFID animus is due to its use and promotion by players such as Wal-Mart and the U.S. military. But it is incorrect to assume that something is dangerous to civil liberties simply because the military and a large and influential company choose to employ it. Nor is concealability a badge of malevolence. For all the alarm, there is a dearth of cases in which people have proved, or even claimed, that they personally have been harmed by RFID. Since any technology can be misused, the focus should be on the human element.

Those concerned about personal data falling into the wrong hands might concentrate on government lapses, lost laptop computers, and the like. The judicious use of RFID tags might even make those lost laptops, containing sensitive personal data, easier to track. Privacy advocates, meanwhile, would do better to concentrate on issues like the politicization of such agencies as the IRS.

The technology involved in RFID has been miniaturized about as far as possible. A similar treatment is long overdue for government, which needs slimming down, to say the least. But rather than downsizing, government is expanding its reach through heavy-handed attempts to ban or regulate a technology that makes life easier for individuals and businesses alike. And activities that government is appropriately engaged in would also benefit from using RFID.

After 9/11, securing our homeland became an urgent policy objective, but the achievement of it has been elusive. Technology can go a long way toward keeping our citizens safe. In the pursuit of effective programs to protect our nation from terrorism, high-tech measures such as e-passports are part of the solution, not part of the problem.

RFID is already in widespread use, cannot be un-invented, and is unlikely to be stopped by a ban at any level. Partisans of regulation hailed Senator Simitian's IIPA as model legislation for all states. Instead, Governor Schwarzenegger's veto should serve as a model, as he avoids forestalling the benefits of RFID with hasty and excessive regulation. There is a better way to go.

"In the end, this issue is going to come down to market forces," says Mark Roberti of *RFID Journal*. "That is the one issue Katherine Albrecht, founder of CASPIAN, and I do agree on. I don't believe companies can shove this technology down people's throats if they don't want it. I also don't believe that privacy advocates can scare people into rejecting products with RFID transponders. People are smarter than that."⁶

Endnotes

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About the Author

K. Lloyd Billingsley **Editorial Director**

Editorial director Lloyd Billingsley has been widely published on topics including popular culture, defense policy, education reform, and many other current policy issues. He has written a number of PRI education studies, including *California's Charter Schools: Empowering Parents, Students and Teachers* and *Expanding the Charter Idea*, and was editor of the Institute's *Voices on Choice: The Education Reform Debate*. Mr. Billingsley is also the author of *Hollywood Party: How Communism Seduced the American Film Industry in the 1930s and 1940s* and *From Mainline to Sideline: The Social Witness of the National Council of Churches*.

His articles have appeared in the *Washington Post*, *Wall Street Journal*, *USA Today*, and many other publications. Before joining PRI, Mr. Billingsley was a journalism fellow at the Center for the Study of Popular Culture in Los Angeles and served as a correspondent for the *Spectator* and the *Washington Times*.

About the Pacific Research Institute

The Pacific Research Institute champions freedom, opportunity, and personal responsibility by advancing free-market policy solutions. It provides practical solutions for the policy issues that impact the daily lives of all Americans. And it demonstrates why the free market is more effective than the government at providing the important results we all seek, including good schools, quality health care, a clean environment, and economic growth.

Founded in 1979 and based in San Francisco, PRI is a non-profit, non-partisan organization supported by private contributions. Its activities include publications, public events, media commentary, community leadership, legislative testimony, and academic outreach.

Education Studies

PRI works to restore to all parents the basic right to choose the best educational opportunities for their children. Through research and grassroots outreach, PRI promotes parental choice in education, high academic standards, teacher quality, charter schools, and school finance reform.

Business and Economic Studies

PRI shows how the entrepreneurial spirit, the engine of economic growth and opportunity, is stifled by onerous taxes and regulations. It advances policy reforms that promote a robust economy, consumer choice, and innovation.

Health Care Studies

PRI proposes market-based reforms that would improve affordability, access, quality, and consumer choice. PRI also demonstrates why a single-payer, Canadian model would be detrimental to the health care of all Americans.

Technology Studies

PRI advances policies to defend individual liberty, foster high-tech growth and innovation, and limit regulation.

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PRI reveals the dramatic and long-term trend towards a cleaner, healthier environment. It also examines and promotes the essential ingredients for abundant resources and environmental quality property rights, markets, local actions, and private initiative.

