

# Promise and Peril: A librarian's perspective on the internet of things

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NCSU Libraries  
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**NC STATE UNIVERSITY**



What we talk  
about when we  
talk about the  
Internet of Things

# An IoT device is...

# An IOT device is...

- ▶ A thing.

# An IOT device is...

- ▶ A thing. (Not a GPC.)

# An IOT device is...

- ▶ A thing. (Not a GPC.)
- ▶ With inputs and/or outputs.

# An IOT device is...

- ▶ A thing. (Not a GPC.)
- ▶ With inputs and/or outputs.
- ▶ Connected to a network.

# Useful purposes!

# Useful purposes!

- ▶ Remote sensing

# Useful purposes!

- ▶ Remote sensing
- ▶ Remote/Autonomous control

# Useful purposes!

- ▶ Remote sensing
- ▶ Remote/Autonomous control
- ▶ Machine learning

# Useful purposes!

- ▶ Remote sensing
- ▶ Remote/Autonomous control
- ▶ Machine learning
- ▶ Network interaction

# The Internet Of Things Will Be The World's Biggest Robot



**Bruce Schneier**, CONTRIBUTOR

*I am the CTO of Resilient Systems, Inc.* [FULL BIO](#) ▾

Opinions expressed by Forbes Contributors are their own.



*(Photo by Bill Pugliano/Getty Images)*

The Internet of Things is the name given to the computerization of everything in our lives. Already you can buy Internet-enabled thermostats, light bulbs, refrigerators, and cars. Soon everything will be on the Internet: the things we own, the things we interact with in our daily lives, and things that interact with each other.

What we talk  
about when we  
talk about  
libraries

# A library is...

# A library is...

- ▶ Spaces.

# A library is...

- ▶ Spaces.
- ▶ Services.

# A library is...

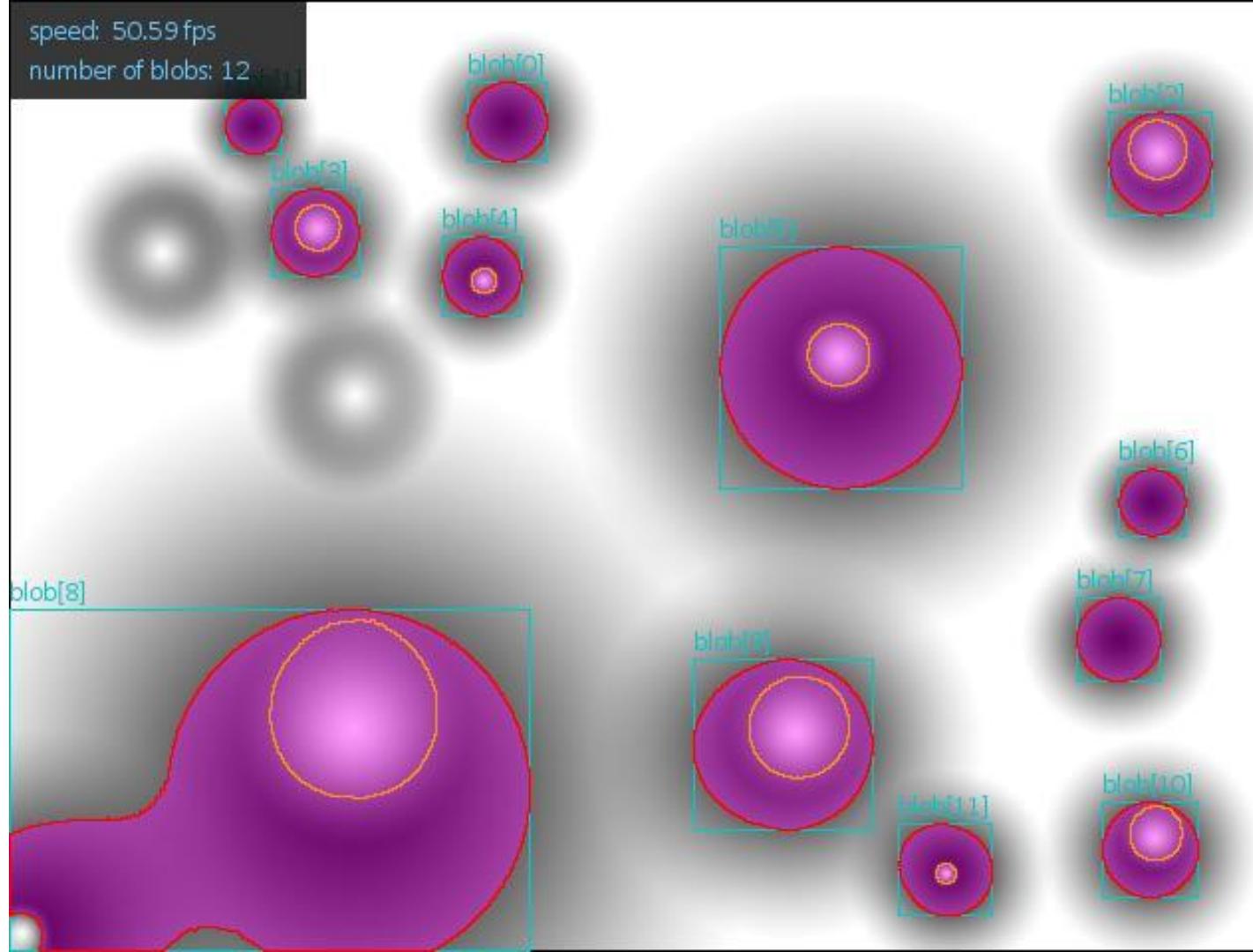
- ▶ Spaces.
- ▶ Services.
- ▶ Collections.

# SPACES



speed: 50.59 fps

number of blobs: 12



[HOME](#)[MAP](#)[ABOUT](#)[API](#)

Architectural and Fine Arts Library 1

41%

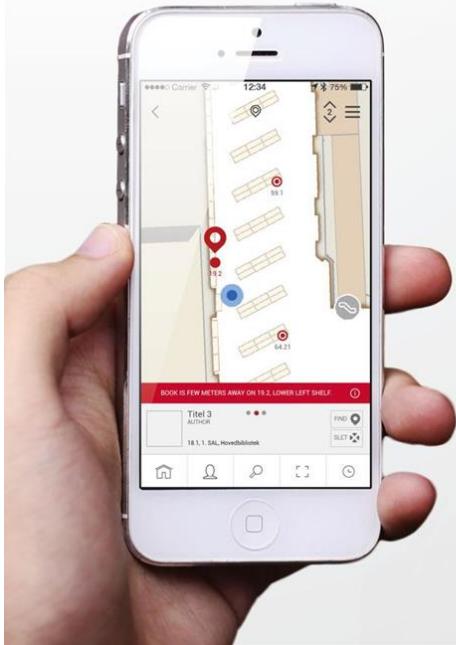
Architectural and Fine Arts Library 2

66%

Architectural and Fine Arts Library 3

99%

# Search, find and connect with iBeacon



iBeacon locates  
app and bookshelves  
through bluetooth



# SERVICES

[◀ Back to Makerspace](#)**NEED HELP?**

Request a technology consultation 

Email us 



Lauren Di  
Monte



Adam Rogers

# Internet of Things

*"The Internet of Things (IoT) is a blending of software and hardware, introducing intelligence and connectedness to objects and adding physical endpoints to software. Radical changes in the hardware development process have made the IoT—and its vast possibility—accessible to anyone."* — Jon Bruner & Mike Loukides, [O'Reilly Media](#)

You can use the tools of the IoT for all sorts of projects, such as designing products like smart watches and door locks, logging data for field research, prototyping "smart home" lighting or energy monitoring, and much, much more.

Radically affordable WiFi modules like the ESP8266 and modular, easy-to-set-up web services like IFTTT (see below) make this exciting development in technology available to all.

## IOT WI-FI ACCESS ON CAMPUS

For an on-campus solution, the Libraries has partnered with NCSU's Office of Information Technology (OIT) to create *Makerspace/OT*, a more open network for experimenting with the Internet of Things in the D.H. Hill Makerpace. Off campus, you should be able to set

[◀ Back to Makerspace](#)

# Makerspace at Hill

## HOURS

Today	10am - 10pm
Nov 23	noon - 6pm
Nov 24	closed
Nov 25	closed
Nov 26	closed
Nov 27	closed

Makerspace hours: [Hill](#) | [Hunt](#)

## NEED HELP?

[Request a technology consultation](#) ➔

[Email us](#) ➔



*The D. H. Hill Library Makerspace is now open! This space gives hands-on access to the emerging technologies of making, and will enable many more students and faculty to work with 3D printing, 3D scanning, electronics prototyping, and other Maker tools.*

The tools listed below as **Available to borrow** can be checked out at the D. H. Hill Ask Us desk. Those under **Use in the library** are available in the D. H. Hill Makerspace for users who have been through our **Orientation**.

## UPCOMING WORKSHOPS

DEC

1

D.H. Hill Makerspace Orientation  
2:00 pm to 2:45 pm

[View all workshops](#) ➔

## LIBRARY STORIES



[Threading the Needle: Fostering Student Success Through Making](#)



[Remaking Teaching: Prototyping New Technologies for the Classroom](#)

[All stories](#) ➔

# The Internet of Things with Buzzfeed's Christine Sunu



## WHEN

September 19, 2016  
6:00pm - 9:00pm

## WHERE

- [D. H. Hill Makerspace](#) at the D. H. Hill Library

## WORKSHOP DESCRIPTION

Join Christine Sunu, Buzzfeed's GE Internet of Things Fellow at the Open Lab for Journalism, Technology, and the Arts, in this interactive workshop that explores IoT technologies with a focus on internet-connected toys and the potential available in connecting emotions and technology.

Christine Sunu is the GE Internet of Things Fellow in Buzzfeed's Open Lab for Journalism, Technology, and the Arts. Her research is focused on the links between emotion, design, media, and IoT. She writes and speaks widely about the importance of human

## INSTRUCTOR



**Lauren Di Monte**  
NCSU Libraries Fellow,  
Cyma Rubin Fellow



**Josephine McRobbie**  
Assistant Director and  
Chief of Staff

# Coding for Wearables I



## WHEN

September 23, 2016  
9:30am - 11:00am

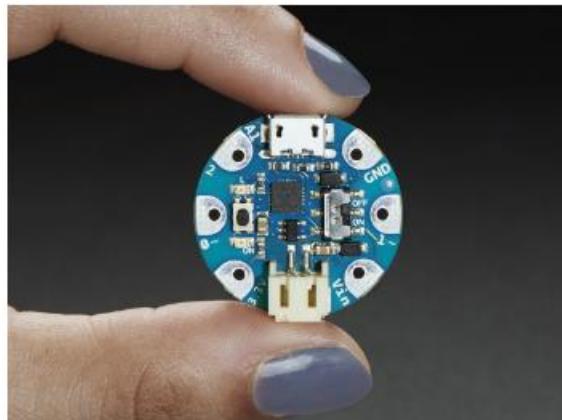
## WHERE

- [D. H. Hill Makerspace](#) at the D. H. Hill Library

## INSTRUCTOR



## WORKSHOP DESCRIPTION



In this session you'll learn how to program the [Arduino Gemma](#), a microcontroller designed for



#### Occipital Structure 3D Scanner

Senses 3D data for many applications. Checks out with an iPad Air 2 for handheld 3D...

Walk Up,

1 Week



#### Intel Galileo Kit

The Galileo is a single-board computer that runs a Linux-based operating system. The...

Walk Up,

2 Weeks



#### Moog Werkstatt-01 Analog Synthesizer

The Moog Werkstatt-01 is a patchable, completely analog synthesizer. Excellent...

Walk Up,

1 Week



#### LightBlue Bean

The LightBlue Bean is a Bluetooth Arduino microcontroller. Using Bluetooth 4.0, it is...

Walk Up,

1 Week



#### NeuroSky MindWave Mobile Brainwave Starter Kit

Learn about how your brain responds to various stimulus with the MindWave Mobile...



#### Muse Brain Sensing Headband

This brain sensing headband is a brain fitness tool that measures brain signals much...

Walk Up,



#### iRobot Create 2 Programmable Robot

Create 2 has a variety of programming methods to grasp the fundamentals of robotics,...



#### Sphero SPRK Robotic Ball

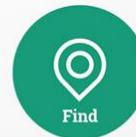
The Sphero SPRK Edition is Sphero's robotic ball platform designed to give orders to...

Walk Up,

# Enhanced library services

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## that help users to help themselves

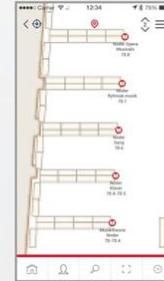
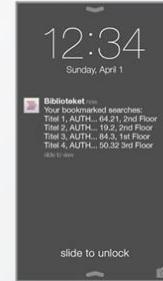


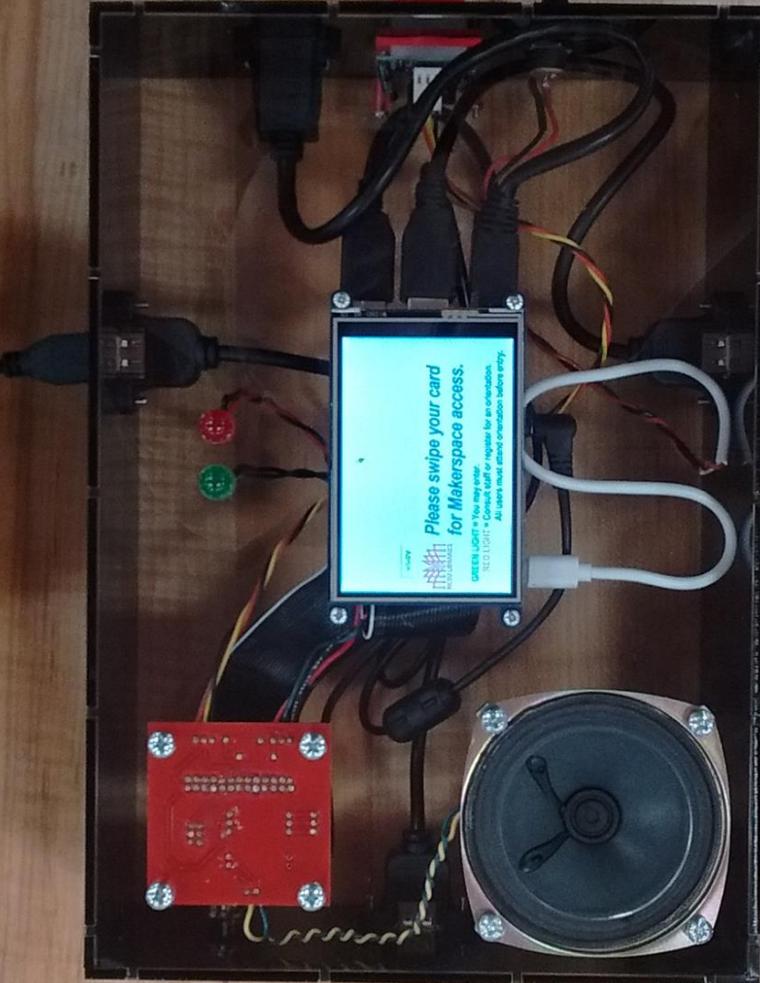
The research showed that people need help with navigating the library.

The app assist in the most complex tasks of the user journey:

Searching, finding and connecting to the library's knowledge base.

By giving users a tool to help themselves in these instances, the library can uses its resources for content curation and extended opening hours.





# COLLECTIONS



#### Occipital Structure 3D Scanner

Senses 3D data for many applications. Checks out with an iPad Air 2 for handheld 3D...

Walk Up,

1 Week



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The Galileo is a single-board computer that runs a Linux-based operating system. The...

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2 Weeks



#### Moog Werkstatt-01 Analog Synthesizer

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1 Week



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The LightBlue Bean is a Bluetooth Arduino microcontroller. Using Bluetooth 4.0, it is...

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Walk Up,



#### iRobot Create 2 Programmable Robot

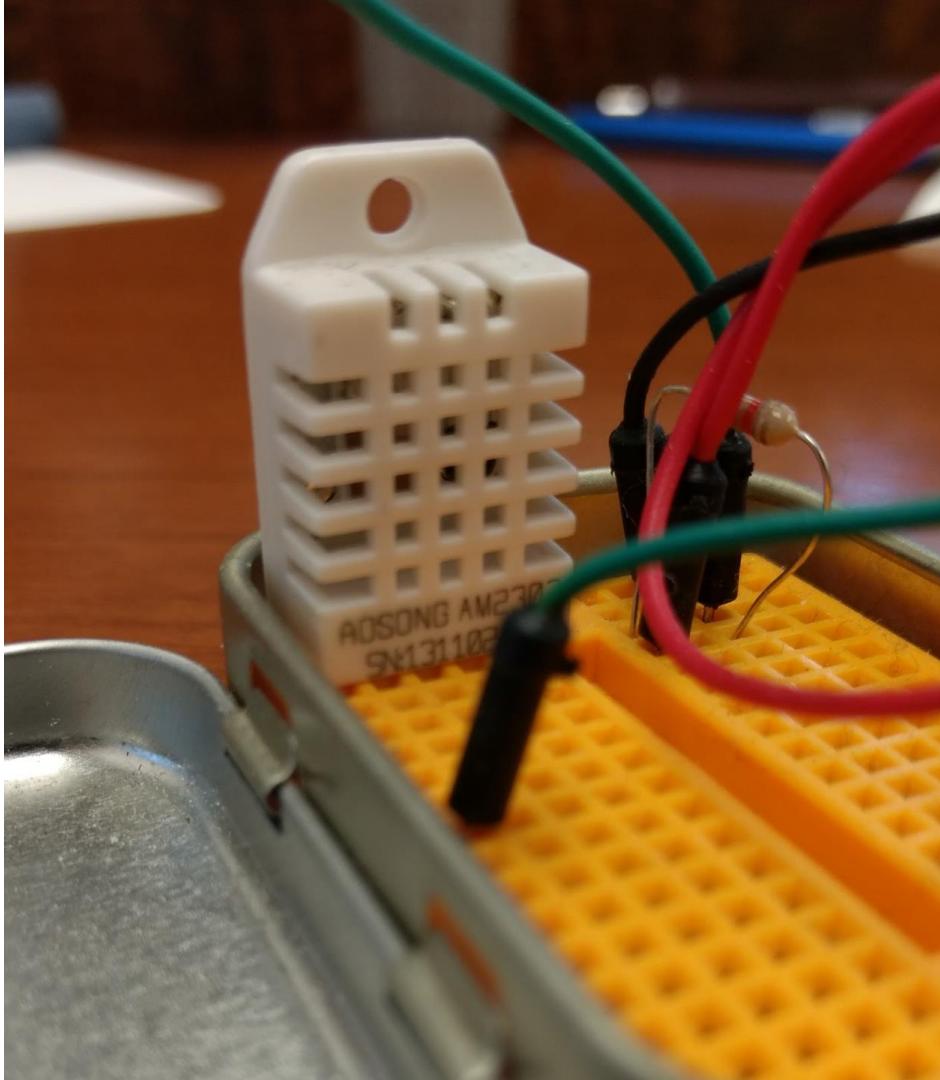
Create 2 has a variety of programming methods to grasp the fundamentals of robotics,...

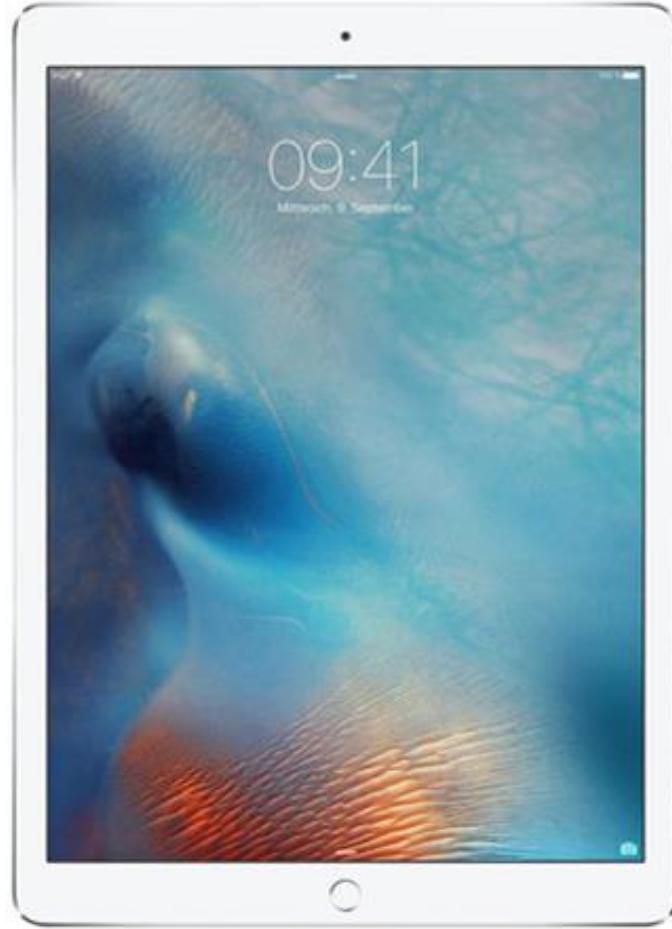
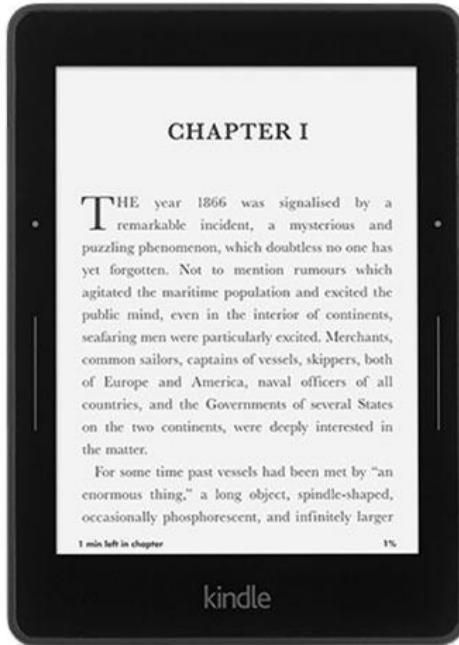


#### Sphero SPRK Robotic Ball

The Sphero SPRK Edition is Sphero's robotic ball platform designed to give orders to...

Walk Up,





# Challenges

# Challenges

- ▶ Vendor vs. Homebrew

# Challenges

- ▶ Vendor vs. Homebrew
- ▶ Create ⇒ Maintain

# Challenges

- ▶ Vendor vs. Homebrew
- ▶ Create ⇒ Maintain
- ▶ Managed account woes

What we talk  
about when we  
talk about  
librarianship

# Librarians believe in...

# Librarians believe in...

- ▶ Knowledge discovery.

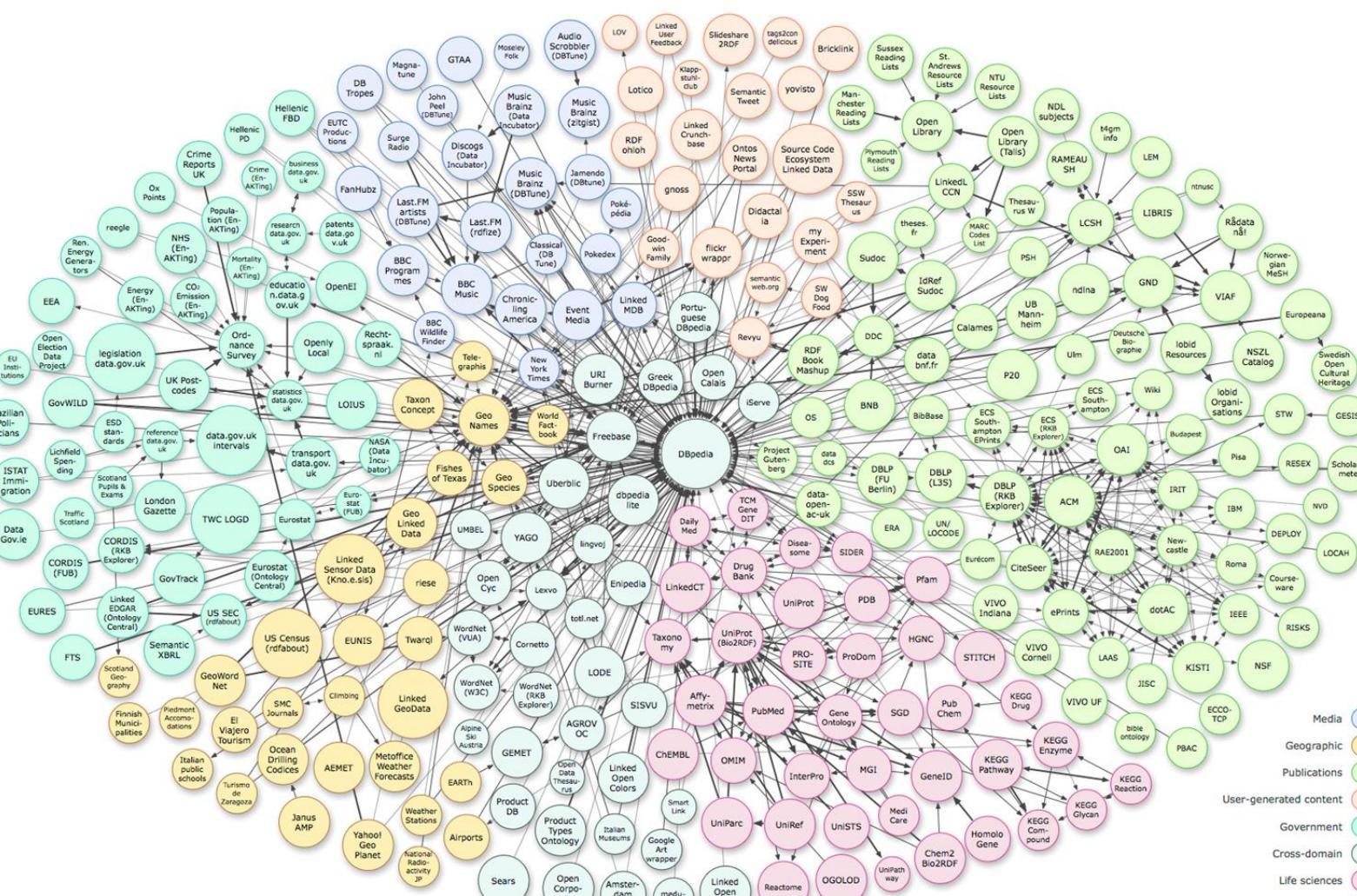
# Librarians believe in...

- ▶ Knowledge discovery.
- ▶ Universal access.

# Librarians believe in...

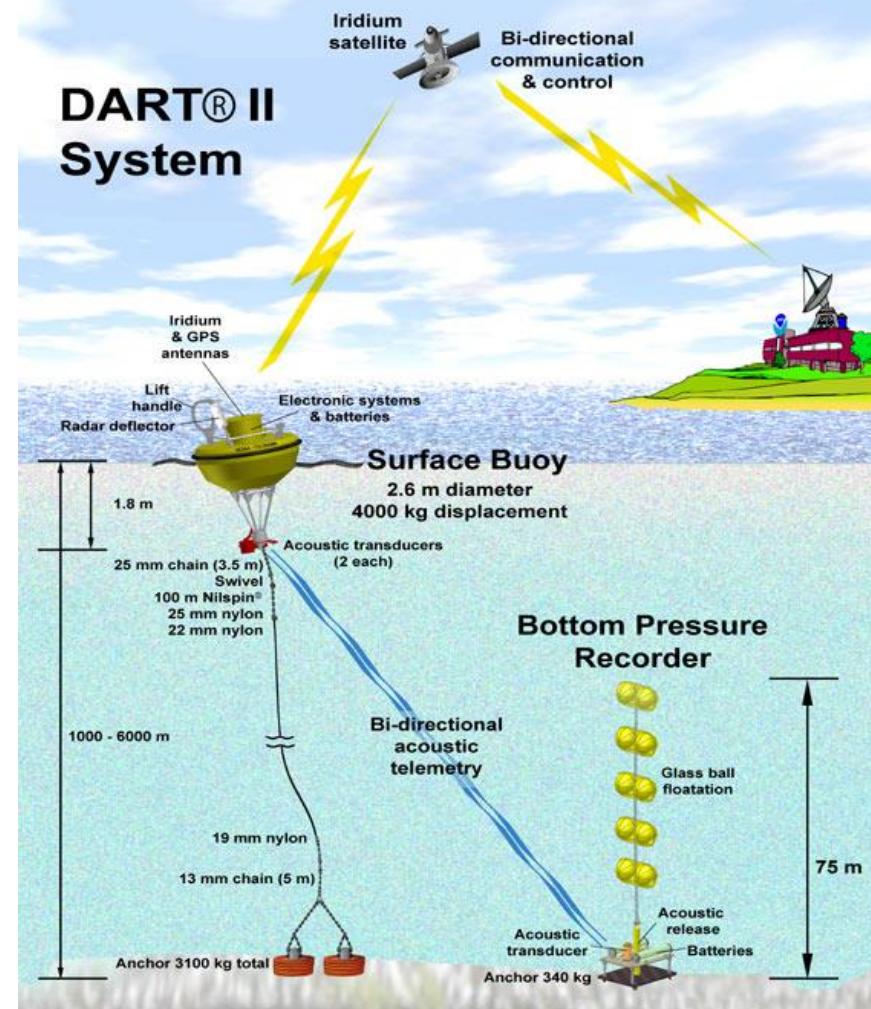
- ▶ Knowledge discovery.
- ▶ Universal access.
- ▶ Intellectual freedom.

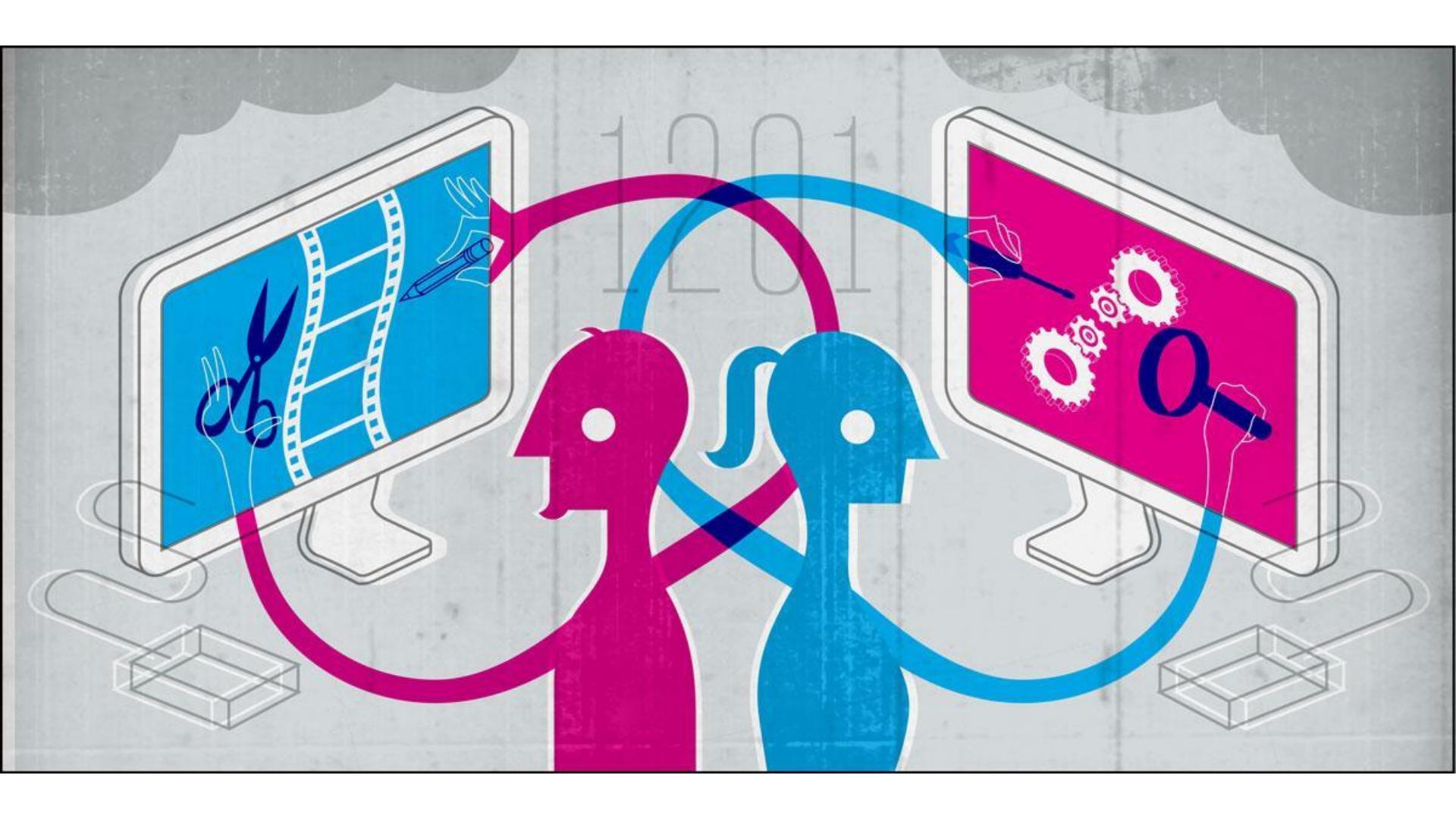
# KNOWLEDGE DISCOVERY



As of September 2011







# PRINT ME IF YOU DARE

FIRMWARE UPDATE ATTACK AND THE RISE OF PRINTER MALWARE

HAVE YOUR EMBEDDED SYSTEMS  
B E E N E X P L O I T E D ?

HOW DO YOU KNOW FOR **SURE**?



COLUMBIA UNIVERSITY  
IN THE CITY OF NEW YORK

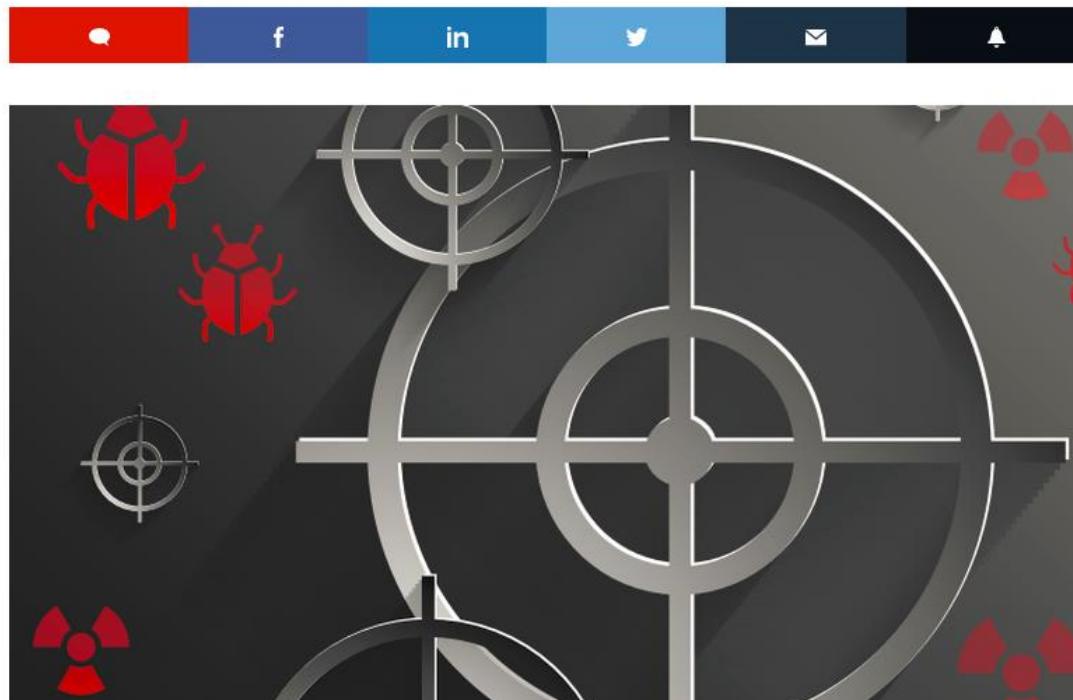
28C3/12.29.2011

# US DMCA rules updated to give security experts legal backing to research

It's taken years, but finally, cybersecurity professionals have been given license to reverse engineer technology.



By Charlie Osborne for Zero Day | October 31, 2016 -- 10:56 GMT (03:56 PDT) | Topic: Security



## RELATED STORIES



Security

**Mirai botnet attack hits thousands of home routers, throwing users offline**



Security

**Tech support scams evolve, borrow tricks from ransomware creators**



Security

**Singapore telcos to support GSMA authentication standard**



Security

**Why a recount is important, and why Trump should support it**

## NEWSLETTERS

### ZDNet Security

Your weekly update on security around the globe, featuring research, threats, and more.

Your email address

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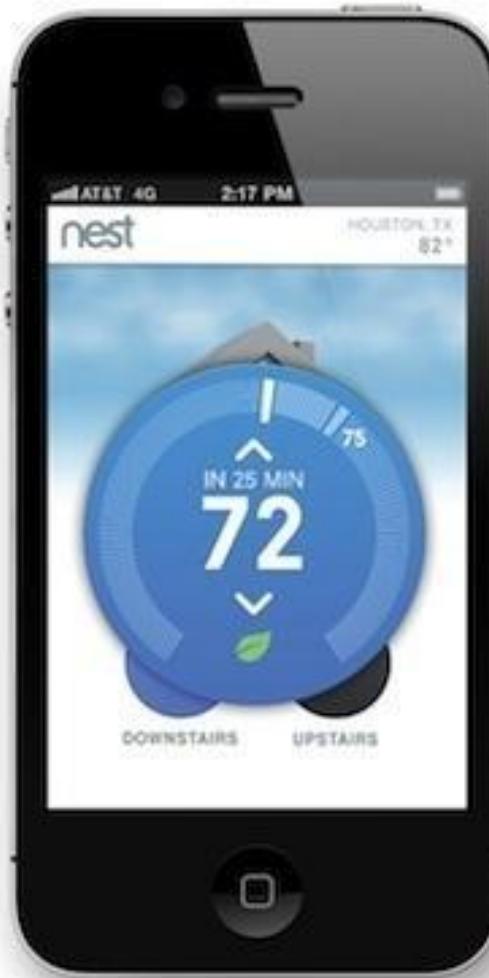
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Kevin Janusz  
@KevinJanusz

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Samsung fridges now have apps like Twitter! #SamsungInnovation

2011.1.10

Stay connected no matter where you are.

Keep up on the latest tweets from everyone you follow.

PANDORA

epi

31

AP

P

Twitter

Gear

## SHARE

 SHARE  
62 TWEET PIN COMMENT  
358 EMAIL

KYLE WIENS BUSINESS 02.05.15 7:00 AM

# NEW HIGH-TECH FARM EQUIPMENT IS A NIGHTMARE FOR FARMERS



## MOST POPULAR



ENGINEERING  
How a 70-Year-Old Idea Could Make Engines Way More Efficient  
5 HOURS



EARLY DAYS  
The Neuroscientist Who's Building a Better Memory for Humans  
5 HOURS



STREAMING SERVICES  
Rejoice! You Can Download Netflix Shows Now For an Offline Binge Fix  
1 DAY



MORE STORIES

# Walmart to shut down DRM music servers

BY [ANDY CARVELL](#)

09.30.2008 :: 5:30AM EST



Walmart – the second largest retailer of downloadable music in the U.S. after iTunes – are switching off their DRM servers; a move that will leave many customers unable to access their legally-purchased music.

In an email to customers, Walmart explains:

*As the final stage of our transition to a full DRM-free MP3 download store, Walmart will be shutting down our digital rights management system that supports protected songs and albums purchased from our site ... If you have purchased protected WMA music files from our site prior to Feb 2008, we strongly recommend that you back up your songs by burning them to a recordable audio CD. By backing up your songs, you will be able to access them from any personal computer.*

# Big Brother: Amazon Remotely Deletes 1984 From Kindles



Ever bought a book from Barnes and Noble, then turned around to find it missing from your bookshelf and replaced with a voucher? Bizarre though it may seem, that's exactly what's happened to hundreds of owners of George Orwell's *1984* and *Animal Farm*



IMAGE COURTESY OF **FRANKIELEON**

## TCP Disconnects “Smart” Lightbulb Servers, Leaves Buyers In The Dark

August 19, 2016  
9:54 am EST

By Kate Cox  @kcoxdc

THE INTERNET OF  
DISCONNECTED  
THINGS

SMARTBULB

This is, unfortunately, becoming one of the most predictable stories of the early 21st century. It goes something like this: new tech product comes on the market. Consumers, finding product solves their problem, eagerly buy. Then the company that made the product turns off the server that made the thing “smart,” and suddenly early adopters are up a creek with no recourse.

This time around, the story is about lightbulbs.

# The End of Ownership

PERSONAL PROPERTY IN THE DIGITAL ECONOMY



Aaron Perzanowski and Jason Schultz

# INTELLECTUAL FREEDOM

[Advocacy Events](#)[Advocacy University](#)[Federal Legislation & Regulation](#)

## Issues

[Access](#)[Broadband & E-Rate](#)[Copyright](#)[Diversity, Equity, and Inclusion](#)[Ebooks](#)[Filters & Filtering](#)[Intellectual Freedom](#)[Intellectual Freedom eLearning](#)[Censorship & First Amendment Issues](#)[Library Bill of Rights](#)[Access for Children and Young Adults to Nonprint Materials](#)

# Library Bill of Rights

The American Library Association affirms that all libraries are forums for information and ideas, and that the following basic policies should guide their services.

I. Books and other library resources should be provided for the interest, information, and enlightenment of all people of the community the library serves. Materials should not be excluded because of the origin, background, or views of those contributing to their creation.

II. Libraries should provide materials and information presenting all points of view on current and historical issues. Materials should not be proscribed or removed because of partisan or doctrinal disapproval.

III. Libraries should challenge censorship in the fulfillment of their responsibility to provide information and enlightenment.

IV. Libraries should cooperate with all persons and groups concerned with resisting abridgment of free expression and free access to ideas.

V. A person's right to use a library should not be denied or abridged because of origin, age, background, or views.

VI. Libraries which make exhibit spaces and meeting rooms available to the public they serve should make such facilities available on an equitable basis, regardless of the beliefs or affiliations of individuals or groups requesting their use.

Adopted June 19, 1939, by the ALA Council; amended October 14, 1944; June 18, 1948; February 2, 1961; June 27, 1967; January 23, 1980; inclusion of "age" reaffirmed January 23, 1996.

A history of the Library Bill of Rights is found in the latest edition of the [Intellectual Freedom Manual](#).

Although the Articles of the Library Bill of Rights are unambiguous statements of basic principles that should govern the service of all libraries, questions do arise concerning application of these principles to specific library practices. See the

The FBI  
has not  
been here

(watch very closely for removal of this sign)

Copyright 1996, Home Entertainment, Inc.

Union Bank



NEA BOSTON

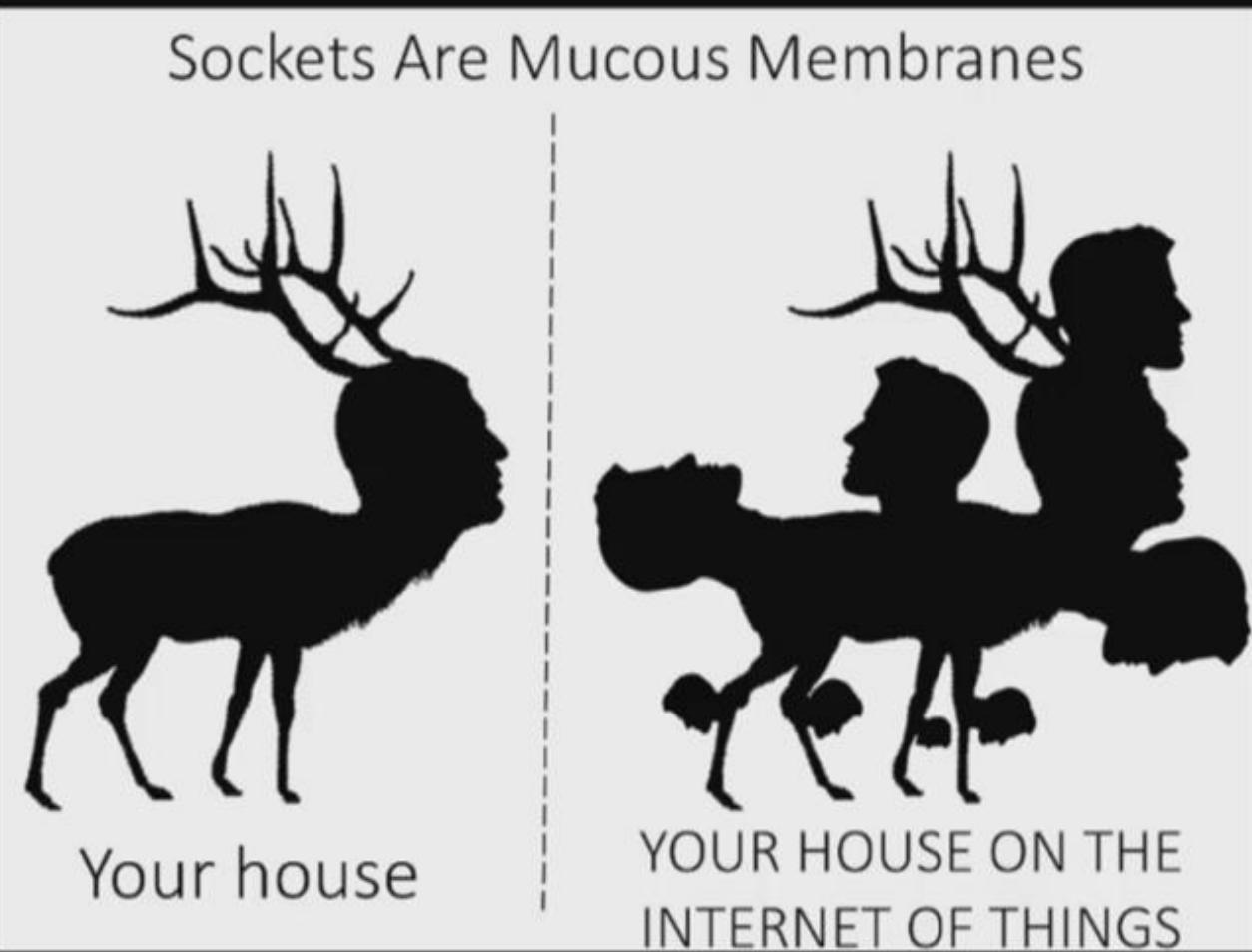


Prices

GENE

G





Sockets Are Mucous Membranes



Your house



YOUR HOUSE ON THE  
INTERNET OF THINGS

GEAR &amp; GADGETS —

# Peep show: inside the world of unsecured IP security cameras

Want to peer into businesses around the world, look through red light cameras ...

TOM CONNOR - 1/12/2011, 12:10 AM

77

If you're in public, you're on camera. If you walk into a coffee shop, the owner gets you at the register. Visit a larger store, and chances are they have your face as soon as you cross the threshold. At least one or two of your neighbors catch you on camera when you walk around your neighborhood, and many cities monitor traffic using red light cameras at major intersections. The question is no longer if you're on camera, but rather how many different angles you were caught on while going about your day.

f

t

With so much monitoring taking place, and with surveillance systems gaining more online functionality every year, it's natural that securing these systems would become... complicated. And that many many are secured incorrectly or not at all. Because so many cameras and surveillance systems are completely open, it's possible for anyone with Internet access to watch literally thousands of cameras online using only Google and a kindergartener's understanding of the 'Net. With a little time and patience, almost any given system, from a set of residential cameras to those used by your local police, can be accessed, viewed, and even reset if not properly secured. Of course, if you can do this, it means that *anyone* can do it.

# Using a Samsung smart fridge could leave your Gmail account vulnerable to hackers

Max Slater-Robins

⌚ Aug. 24, 2015, 7:54 AM 1,844



FACEBOOK



LINKEDIN



TWITTER



Hackers have found a way to exploit a Samsung smart fridge in order to access the owner's Gmail credentials, according to *The Register*.

Pen Test Partners, a firm that specialises in finding exploits, discovered a man-in-the-middle vulnerability in Samsung smart fridges. A man in the middle attack is where a hacker intercepts a piece of data as it passes between a server and the device, in this instance a fridge.

The hack was discovered in Samsung's [RF28HMELBSR](#) fridge which has a Wi-Fi capability that allows a user to show their Gmail calendar on the display. While Samsung has implemented a [Secure Sockets Layer \(SSL\)](#), the fridge fails to validate the certificates that come as part of the SSL protocol, leaving the device vulnerable to attack. For an SSL certificate to be valid, the browser must receive a valid code back from the website host, something Samsung failed to do.



A Samsung smart fridge. David Becker/Getty Images



# The Internet of Things Will Turn Large-Scale Hacks into Real World Disasters

July 25, 2016 // 09:30 AM EST



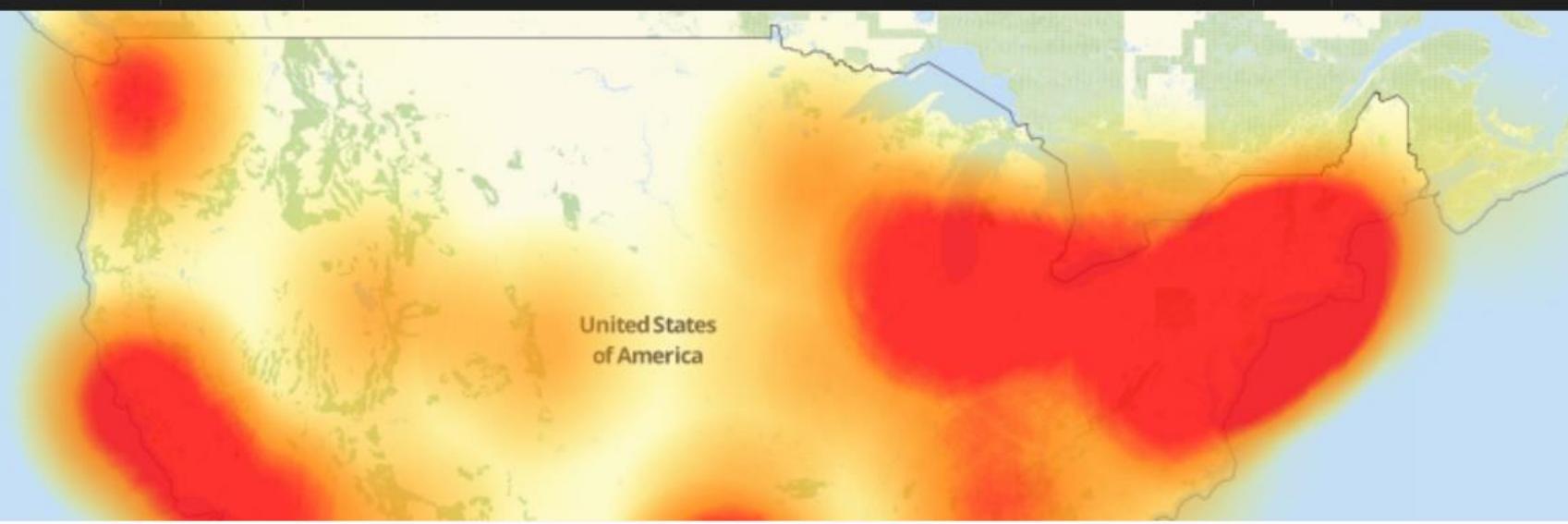
Written by  
**BRUCE SCHNEIER**



Disaster stories involving the Internet of Things are all the rage. They feature cars (both driven and driverless), the power grid, dams, and tunnel ventilation systems. A particularly vivid and realistic one, near-future fiction published last month in *New*

FOLLOW US EVERYWHERE





# Blame the Internet of Things for Destroying the Internet Today

October 21, 2016 // 04:35 PM EST



Written by  
**LORENZO FRANCESCHI-BICCHIERAI**  
STAFF WRITER



A massive botnet of hacked Internet of Things devices has been implicated in the cyberattack that caused a significant internet outage on Friday.

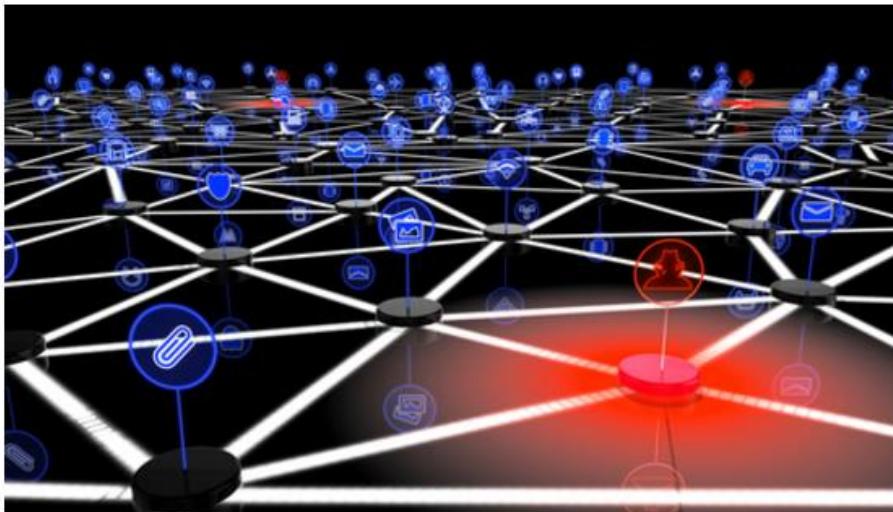
FOLLOW US EVERYWHERE



## 21 KrebsOnSecurity Hit With Record DDoS

SEP 16

On Tuesday evening, KrebsOnSecurity.com was the target of an extremely large and unusual distributed denial-of-service (DDoS) attack designed to knock the site offline. The attack did not succeed thanks to the hard work of the engineers at **Akamai**, the company that protects my site from such digital sieges. But according to Akamai, it was nearly double the size of the largest attack they'd seen previously, and was among the biggest assaults the Internet has ever witnessed.





## Johnson & Johnson Warns Patients Insulin Pump Is Hackable But “Low Risk” Of Attack

October 4, 2016

9:21 am EST

By [Kate Cox](#)  @kcoxdc

STRAIGHT OUT OF  
SCI-FI

PRIVACY | HACKS

JOHNSON & JOHNSON

Tech can be pretty great, and smart, connected tech can be really great. Miniaturization and the ability to control devices remotely has led to some fantastic advances in, for example, health care. But today in “wow, our glorious tech-driven future is so strange and dystopic some days,” we are reminded that anything that can be networked is vulnerable, and can be hacked.

Reuters [reports this morning](#) that Johnson & Johnson has found that one of its medical devices has a bug in it that can leave it vulnerable to remote intrusion — i.e., hacking.



CATS: ALL YOUR BASE ARE BELONG  
TO US.

What's a  
librarian to do?

# What you can do

# What **you** can do

- ▶ Promote research

# What **you** can do

- ▶ Promote research
- ▶ Increase awareness

# What **you** can do

- ▶ Promote research
- ▶ Increase awareness
- ▶ Establish standards



I FIGHT

FOR THE USERS

# Thanks!

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Andreas K. Orphanides  
akorphan@ncsu.edu



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[Heatmap](#): Measure the Future Project

[Density](#): ADI

[Copenhagen Library app](#): Andreas Schuster

[Linked data](#): Max Schmachtenberg, Christian Bizer, Anja Jentzsch and Richard Cyganiak. CC-BY-SA 3.0

Smart buoys: NOAA [\(1\)](#) [\(2\)](#)

[Pink and blue hacking](#): Electronic Frontier Foundation

[Kindle Unlimited](#): Amazon

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[All your base](#): Zero Wing (Mega Drive), Sega (via Albino Black Sheep)

[Fight for the users](#): Tron, Walt Disney Productions (via Pinterest)

Device images belong to their respective manufacturers

Article screencaps from articles listed in sources

All other images NCSU Libraries and North Carolina State University

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