What is the "Internet of Things"?

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Motivation / Introduction

- I'm Open Source Software developer
- you make money by selling services – not licenses
- enough to live but not enough to kill
- example: Linux kernel ISDN-driver problem
  - customer had difficult problem where machine would die after some days or weeks – critical application
  - customer payed me to find and fix the bug (without a guarantee from my side)
  - bug was found and fixed, solution is available to *all* users of the kernel

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No definition: It's what we make it

- IoT: Buzzword coined in the 1990ies

- Wikipedia has good definition

- Will (hopefully) replace building automation buses like KNX, LON

- There are many nice applications

- Security: Danger ahead!

- Why is this possible today?

- I'll give some (crazy?) examples in the following

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Brave New World?

- 2011: "Google showed a sneak preview of its Android@Home project, which will extend the Android platform into household objects" "For Google, the Android@Home project is a first step into 'the internet of things'" [Isa11]
- yesterday (2014-06-03): "Apple attempts to conquer the connected home" "at WWDC 2014's opening keynote ... Craig Frederighi, Apple's VP of software engineering, made mention of Apple's new foray into home automation [Gor14]

Do we want this? In the post-Snowden era??

Brave New World?
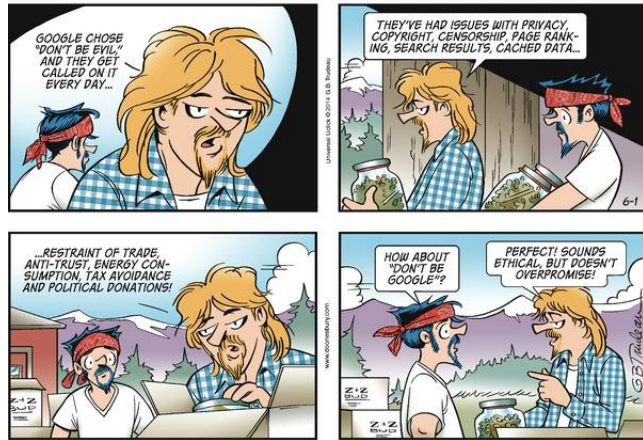
Doonesbury Cartoon Washington Post 2014-06-01 [Tru14]

Don't Get Trapped in a Data Silo

We as users need to decide what applications we use:

"These problems cannot be solved by the companies themselves. Companies make silos. It's as simple as that. Left to their own devices, that's what they do. Over and over and over again."

Doc Searls (Co-author of Cluetrain Manifesto [LLSW00]) in blog article "Silos End"

Security: Who owns your device?

- Do you control your device?
- Who controls the software you use?
- What does this software do with your data?
- We know several commercial products with deliberately broken encryption
- → With open source software we have a chance to find out
- → … we also need to own the tools for making the software
- → Let's not make it too easy for THEM :-)

Open Source Definition

- Free Redistribution
- Source Code
- Derived Works
- Integrity of The Author's Source Code (may)
- No Discrimination Against Persons or Groups
- No Discrimination Against Fields of Endeavor
- Distribution of License
- License Must Not Be Specific to a Product
- License Must Not Restrict Other Software
- License Must Be Technology-Neutral

Open Hardware Design

- You can't share the hardware
- or in other words: copying the hardware isn't cheap
- but we can share the *Design*
- everybody can build his/her own machine
- . . . and we can improve it together
- what are the critical factors:
  - why hasn't anybody thought of that before?
  - why is this possible *now*?
- Neil Gershenfeld, MIT Center for Bits and Atoms, in "FAB" [Ger05]: personal fabrication today similar to personal computing in the 1970s

Hardware Licensing

- Design (e.g. printed circuit) is protected by copyright
- . . . but not in every case the actual device [Wei12]
- Instead hardware is usually covered by patents
- . . . not every design is patentable
- . . . and cost is a major factor
- Special open hardware licenses
- TAPR Open Hardware License [Ack07]
- CERN Open Hardware License [Ser11]
- → Hardware licenses are work in progress

## Critical Factor: Microcontrollers

- Arduino: Open Hardware Design with Atmel Microcontroller
- With Open Source Development Environment
- Several Variants in different sizes
- Everybody is free to create own variants
- lots of input/outputs to interface with physical hardware (motors, photo resistors, . . .)
- Large library, good tutorial, ready-made solutions
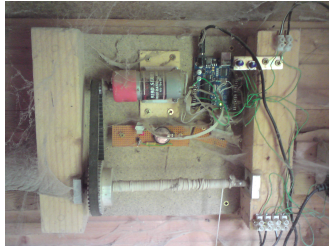- → make "almost anything" (Neil Gershenfeld) which can be controlled by a computer

Arduino: Example: Watering
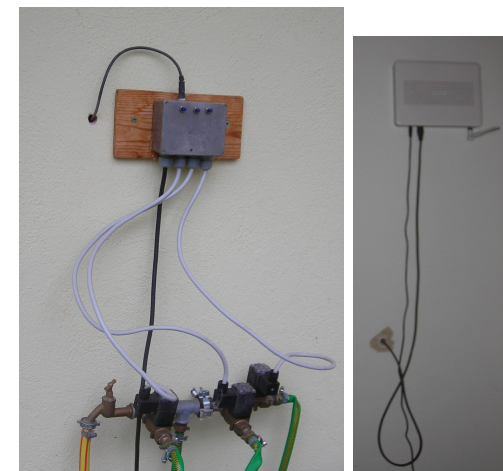
Arduino: Example: Chicken Door

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