Issue 029: Internet Of Things

Adrian Kosmaczewski

February 1st, 2021

Welcome to the twenty-ninth issue of *De Programmatica Ipsum*, dedicated to the subject of *Internet of Things*. In this edition:

- Graham tells his own personal IoT story[1] filled with pain and irony.
- Adrian argues that the IoT industry is the next target for government regulation[2].
- In the Library section[3], Graham talks about "Gödel, Escher, Bach" by Douglas Hofstadter[4] and its relationship with code and computers.

Enjoy this issue! Please subscribe to our free newsletter[5] to stay updated about new releases, share the articles on social media, or contribute[6] if you would like to support our work.

Cover photo by Dan LeFebvre[7] on Unsplash[8].

[1] https://deprogrammaticaipsum.com/internet-of-unusable-things/
[2] https://deprogrammaticaipsum.com/on-the-need-of-regulation-in-the-iot-industry/
[3] https://deprogrammaticaipsum.com/category/library/
[4] https://deprogrammaticaipsum.com/douglas-hofstadter/
[5] https://deprogrammaticaipsum.com/newsletter/
[6] https://deprogrammaticaipsum.com/contribute/
[7] https://unsplash.com/@danlefeb?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText
[8] https://unsplash.com/s/photos/iot?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText

Internet Of Unusable Things

Graham Lee

February 1st, 2021

This issue of *De Programmatica Ipsum* comes out as I have been in my current house for four years. The previous owners had installed a smart thermostat to control the heating and hot water, and had left it and the control hub along with all the instructions.

Needless to say, I could not actually use it, and had limited control over the heating in my house. The reason "smart home" technology exists is not because it is better for us home dwellers, but because the vendors get to generate a bunch of data about us and sell it (more accurately, to sell insights that they claim are derived from the data to marketers. Nobody *actually* sells data in the data economy; that would be selling the goose that lays the golden tracking cookies).

Not knowing who I am, but of course knowing that I am no longer the previous inhabitant of my house, my thermostat was out of my control. I could set some controls from the physical panel, though not the time which meant that the schedule features were becoming counterproductive as the device's idea of what time it was became increasingly inaccurate. Of course, it can synchronise the time over the internet; just not over *my* internet.

Eventually it became clear that something needed to be done, and not wishing to fuss with my central heating system the easiest solution was to get a new hub and connect the thermostat to it. Remember how I said that the vendor is in the data business, not the smart home business? They wanted *EVEN MOAR DATAS* and made it cheaper for me to buy a hub and a collection of "smart" lightbulbs than the hub alone.

I set up the new hub, and it would not of course pair with the thermostat. So a call to support (they have since removed the phone number from their website, and redirect help requests to their "community forum": they are in the data business, not the customer support business) later, and I find that I am supposed to go up into my attic, lean out from the rafters to the hot water tank, and hold some buttons on the side of the tank until a light starts flashing. Now the hub and the thermostat want to talk to each other, which the customer support agent demonstrates *by turning my heating on and off remotely*. End-to-end encryption has not made its way to the Internet of Shit yet, but it is nice to know that if the vendor ever identifies themselves in this post and are feeling vindictive they can turn my heating off at will.

Oh yes, I forgot to mention the lightbulbs. Screwed them in (I needed to replace cold cathode bulbs with LEDs anyway, and they were free), switched them on, all good. Well, mostly all good: one quickly dropped its connection to the hub and would announce this by flashing on and off. Another call to support, another demonstration of their power over my private life, and we are all back to normal.

And of course, I can connect all of this to Apple Home, accessed from my smartphone. So I can now, if I want to turn a light on, get my phone out (if it has signal), unlock it (not easy with a facemask), navigate to the Home app, find out which of the lightbulb icons represents the target Thing, and it is just a tap to turn it on. As long as my phone has signal, and the home internet is connected, and the network between the two has not been partitioned, and the hub is not having a strop. And of course, nobody else can do that, *even if they are sitting in the dark in the room with the lightbulb*. Is not technology marvellous?

Cover photo by CHIRAG K[1] on Unsplash[2].

[1]https://unsplash.com/@chiragggg?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText

[2]https://unsplash.com/s/photos/candle?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText

On The Need Of Regulation In The IoT Industry

Adrian Kosmaczewski

February 1st, 2021

Reading this magazine is a political act. When choosing between Pravda or the Financial Times; Fox News or PBS; Daring Fireball or Paul Thurrott's SuperSite for Windows, a reader should know what those publications stand for. Every newspaper, every magazine, every blog, every podcast has a point of view, a flag, a position, to be defended and to be upheld. Paraphrasing the words of the "Think Different" campaign, one can disagree with them, vilify them, but one must be sure that each of these publications tries hard not to be ignored. Choosing whichever option is, simply put, a political act.

This monthly publication you are currently reading is no different; particularly when the whole point of these lines is to highlight the conflicts in the crossing paths of technology and humanities. We uphold object-oriented programming and other stable, boring technologies. We encourage, promote, and defend the formation of worker unions in the technology field. We demand the examination of hype and novelty to closer scrutiny, and if all else fails, we subject them to be considered as mere reinventions. We think that online (and offline) privacy and security are basic human rights. But above all, we condemn and abhor both the growing technological analphabetism of ruling elites in the highest political circles, *and* the lack of political education, involvement, and interest of so-called "technology enthusiasts."

The previous two paragraphs should have set the tone for the subject of this month: "Internet of Things." TL;DR: it is not pretty, and we need global state intervention in this industry, fast.

The author types these words precisely when the Raspberry Pi Pico hits the newsstands[1]

[1] https://www.raspberrypi.org/blog/raspberry-pi-silicon-pico-now-on-sale/

(literally) at 4 USD. The specs are impressive[2], and they will get better in the following years. From the myopic point of view of cost management in a First World country, it seems as if any and every thing sold in the market could come bundled with a CPU and some on-board Flash memory. Now you can even embed a JavaScript engine[3] inside of those "smart" things, because Atwood's Law[4] applies here as well.

Add to the mix a smartphone app, and now you can turn on and off your car parking doors from the confort of your Tesla (something you could already do in the 1970s with an infrared remote control, no Bluetooth needed), or even fancier, whoop whoop! Via an Alexa "Routine". How about that. Poor Jeff Bezos needs to know more about you, he's short on cash.

Light bulbs? Check[5]. Thermostats? Check[6]. Headphones? Check[7]. Cars? Check[8]. TV sets? Check[9]. Security cameras? Check[10]. Home weather stations? Check[11]. Bycicle locks? Check[12]. Smoke detectors? Check[13]. Pet trackers? Check[14]. Sex toys? Check[15].

Of course, after decades of growth, it would be disingenous to look away or pretend that this industry does not exist. At a time when there are already industry alliances[16] ready to lobby for more "innovation" in the sector (read: less government intervention), what the IoT market needs (and fast) is, precisely, more and better regulation (or, as it is the case in many countries, any regulation at all).

Following the tracks of the GDPR[17] and the CCPA[18] I expect either the European Union or California to come up with a set or rules, including both suitable quality standards for IoT devices, as well as the creation of ruling bodies to uphold them. Standards which, in the opinion of this writer, should cover the following tenets (at the very least):

- Openness: Source code of all approved IoT devices must be made available to the public (not necessarily with open source licenses, but openly available for download and inspection) and cryptographically signed. This is needed to verify the integrity of the binaries installed after each update, and to prevent the inevitable decay[19] of closed-source code.
- Security: Changing the default password on devices must be mandatory upon installation; data encryption standards must be provably used in all storage and communi-

[2] https://www.raspberrypi.org/documentation/pico/getting-started/

[3] https://jerryscript.net/

[4] https://blog.codinghorror.com/the-principle-of-least-power/

[5] https://www.msn.com/en-us/news/technology/now-a-smart-lightbulb-system-got-hacked/ar-BBZFLHE

[6] https://www.fox6now.com/news/felt-so-violated-milwaukee-couple-warns-hackers-are-outsmarting-smart-homes

[7] https://nypost.com/2019/08/13/hackers-can-turn-headphones-into-acoustic-weapons-cyber-security-expert-warns/

[8] https://www.kmov.com/news/st-louis-hills-man-says-thieves-remotely-hacked-into-his-car-s-security-system-before/article_bfab00b2-5f86-11eb-aa1c-1b672231bb6d.html

[9] https://www.wired.com/2017/03/worried-cia-hacked-samsung-tv-heres-tell/

[10] https://gizmodo.com/a-home-security-worker-hacked-into-surveillance-systems-1846111569

[11] https://www.computerworld.com/article/2884201/partly-cloudy-with-a-chance-of-hacking.html

[12] https://www.tomsguide.com/us/bluetooth-lock-hacks-defcon2016,news-23129.html

[13] https://blogfactory.co.uk/2019/07/24/smoke-detectors-are-secretly-spying-on-us/

[14] http://petslady.com/article/pet-trackers-are-hackable-too

[15] https://www.vice.com/en/article/m7apnn/your-cock-is-mine-now-hacker-locks-internet-connected-chastity-cage-demands-ransom

[16] https://aioti.eu/

[17] https://en.wikipedia.org/wiki/General_Data_Protection_Regulation

[18] https://en.wikipedia.org/wiki/California_Consumer_Privacy_Act

[19] https://twitter.com/om/status/1348430175667687425

cation; *et caetera*.

- Privacy: The absolute and total disclosure of the use of personal data gathered by these devices is a *conditio sine qua non* for the marketing, distribution, and sale of these devices. This point should already be mostly covered by the aforementioned regulatory rules, GDPR, CCPA, and others similar, but should include extensions and provisions specific to IoT devices.
- Traceability: Software updates must be submitted to a regulatory body for archival, so as to guarantee the perennity and accessibility of hardware devices using them in the future. IoT devices must have a longer life than what we have seen so far.
- Compatibility: Existing standards (operating systems, networking protocols, hardware ports, power outlets, and others) must be preferred and prioritised above "innovations" at all times. Users must be able to access their devices using any major commercial operating system of their choice, *plus* Linux or any other free software option. This includes mobile operating systems.
- Accessibility: All users, regardless of their disabilities, must be able to configure, operate, and dispose of these systems freely and independently, at any time.
- Environmental issues: companies producing IoT devices must be held responsible for the collection, disposal, and recycling of all IoT devices they have produced, including the components thereof.

The actual list of tasks of such a regulatory body would be much larger, of course; but this should provide a starting point for its activities. Plus, of course, the requirement for inspections and sanctions, if needed (hint: it will be needed. It is already the case.)

In these pages we have talked about similar issues many times: Graham mentioned[20] the need to *"...move from a situation in which we expect people to buy (or lease) a new handheld computer every 1-2 years, even if their existing one works fine."* This author talked[21] about *"...the idea that making a better world with software means being sincere to one another. Avoid the lies. Do not be a hypocrite. Be upfront about the shortcomings of your software"* and even proposed a "Hippocratic Oath" for the software industry[22].

As funny and as entertaining as the "Internet of Shit"[23] Twitter account might be, a foreseeable solution to the current broken state of the IoT industry will *not* come from the industry itself. It is the sincere hope of this author that governments around the world will regulate this space to mold (if needed, by brute force) this brute mess of unconcious VC-fueled "innovation" startups, into a responsible industry.

Cover photo by Tina Rataj-Berard[24] on Unsplash[25].

[20] https://deprogrammaticaipsum.com/the-twenty-year-computer/

[21] https://deprogrammaticaipsum.com/less-evangelization-more-honestization/

[22] https://deprogrammaticaipsum.com/primum-non-nocere/

[23] https://twitter.com/internetofshit

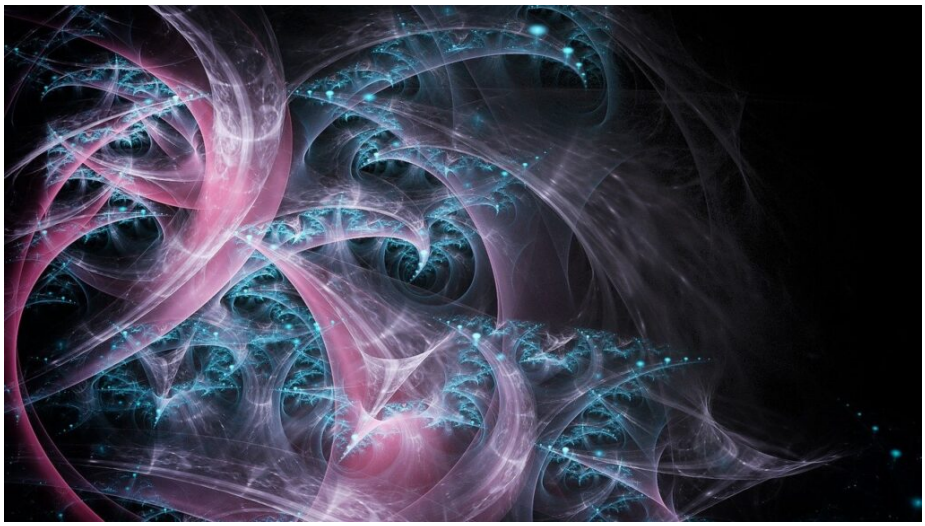
[24] https://unsplash.com/@t_rat_max?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText

[25] https://unsplash.com/s/photos/broken?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText

Douglas Hofstadter

Graham Lee

February 1st, 2021



You may be worried that I am going to talk about an author of books that are not about programming, and you are correct and incorrect. Correct, in that Hofstadter's books are not about programming (the intellectually hollow like to claim that they are not about anything at all, or that if you think you know what they are about then you did not understand them; this is untrue). Incorrect, in that Hofstadter's books and computer programs *themselves* are about the same thing.

You see, computer programs are an attempt to express—in precise, repeatable form—a document describing human cognition. The whole field of logic is an attempt to express the "laws" of rational thought, albeit a flawed one: a logical deduction is certainly rational, though a rational action need not be logically determined. For confirmation of this, look no further than the title of George Boole's work on symbolic logic, "An Investigation of the Laws of Thought, on which are founded the Mathematical Theories of Logic and Probability"[1].

In Boolean logic, a conception can be represented by a symbol in an equation, maybe x or y. The numerical value of the conception represents its truth: at the beginning of the book these values are 0 for contradiction and 1 for tautology, though the book is actually (as the title suggests) about probability and so fractions are introduced to represent the likelihood that a conception is true. Computer scientists presumably only read the first few chapters of any book, and struggle with five-letter words, and therefore programming languages (which used to be designed by computer scientists, before we realised how unrelated those two disciplines are) refer to George as "`bool`" and only use the extremes of the range.

Just as thinkers can combine different ideas to produce new thoughts, the Boolean logic allows for conceptions to be combined using mathematical relations. Multiplication represents intersection: if `x` is sheep and `y` things that are white, then `xy` is white sheep. Addition

[1] http://www.gutenberg.org/files/15114/15114-pdf.pdf

represents conjunction: `x + y` is things that are sheep and things that are white. Minus represents exception: if *x* is all states and `y` is monarchies, then `x - y` is all states except monarchies. This mathematical notation is then used as a convenient shorthand in uncovering basic laws of logic (i.e. of thought), and applying them to such evidently logically-amenable questions as whether gravitation exists, or whether there is necessarily a prime mover.

If George Boole is the 19th century's artificial intelligence scientist, then his contemporary machine learning engineers were Charles Babbage and Ada Lovelace. The Difference Engine, which would be frequently cited as the first example of a (mechanical) programmable digital computer if it had been built at the time, was explicitly designed to *replace* rather than *augment* human thought. Just as modern software engineering managers use Jira to avoid thinking about process engineering.

You see, various forecasting and actuarial tables were constructed by people with slide rules thinking about maths, and Babbage did not like that. Particularly, he did not like the fact that they would occasionally get the thinking wrong. "I wish by God these calculations had been executed by steam," and set about making it so. Or, doing what academics do to this day: acquiring government money to make it so, getting into arguments, then moving on to another project.

So computer science was invented to capture, reproduce, and improve the reliability of thought processes and procedures involving those thought processes. This is why answers to the question of "what constitutes artificial intelligence?" are typically unsatisfying: in reality *all computation is artificial intelligence*. The `&&` operator in C represents logical conjunction; it is an expression of a "law of thought" in the computer.

Even the humble hashmap (a.k.a. Dictionary) is a model of human cognition: note that human memory tends to recall things by association, rather than indexing through everything we know; now represent that idea of association in the computer's "memory".

So now we get disappointing results like the idea that artificial intelligence is research into thoughts that computers cannot yet represent, or worse: artificial intelligence is things a computer does that humans do not yet understand. Representing a function as the sum of a series of other functions is boring old computer science when you are doing a Discrete Fourier Transform; it is AI when you are combining a matrix of sigmoids.

"Gödel, Escher, Bach" is not about computer programming. Rather, it is closer to the truth to say that computer programming is about Gödel, Escher, Bach. But this is a point that was sadly lost on readers of GEB: sadly for everyone except Hofstadter, who got paid to write another book, *I am a Strange Loop*, to explain what we had all missed the first time around.

To this day, there is a Strange Loop conference[2] in computer programming, among those who recognise the computers in themselves, themselves in the computers, and the metacyclic self-reference in the ricercar.

Cover image by dawnydawny[3] from Pixabay[4].

[2] https://thestrangeloop.com

[3] https://pixabay.com/users/dawnydawny-2157612/?utm_source=link-attribution&utm_medium=referral&utm_campaign=image&utm_content=2573303

[4] https://pixabay.com/?utm_source=link-attribution&utm_medium=referral&utm_campaign=image&utm_content=2573303