Your Things Are Shouting At Me

The evolving security landscape of the IoT

Jelte Jansen | SIDN Connect 2019

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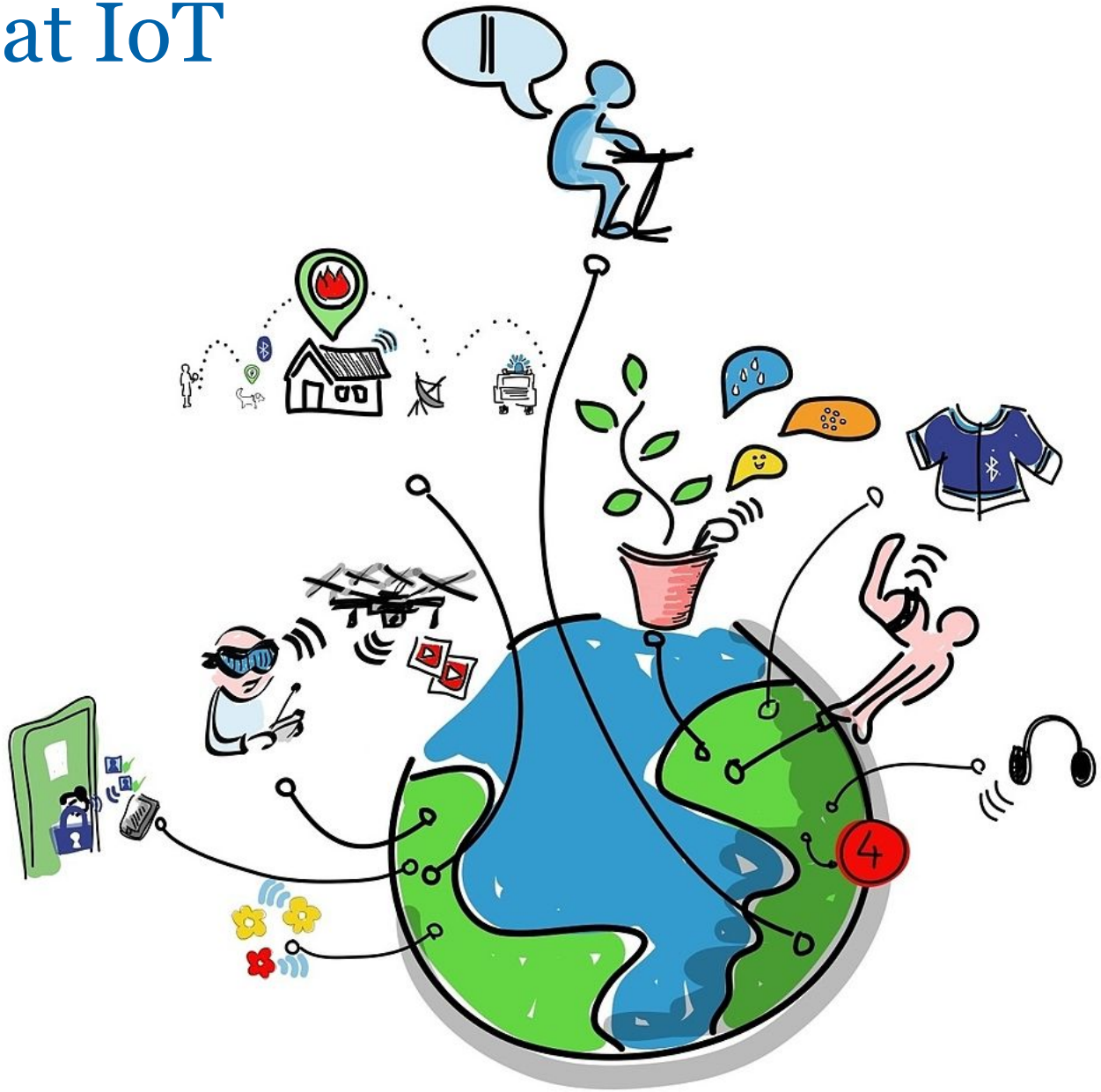
So, about that IoT



Should we even still be talking about 'the IoT'?

- It's really 'just' more computers
- A lot more…
- With dubious track-records, so far…..

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The future of the Internet (of Things)

- Prediction: 21 billion IoT devices in 2025
- source: IoT Analytics 2019

- Prediction: 42 billion IoT devices in 2025
- Source: International Data Corporation

- Prediction: lots and lots of devices in the future
- Source: me

Attributed to @tkadlec

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Dumb to smart, separate to connected

Image created by
http://www.blog.spoongraphics.co.uk

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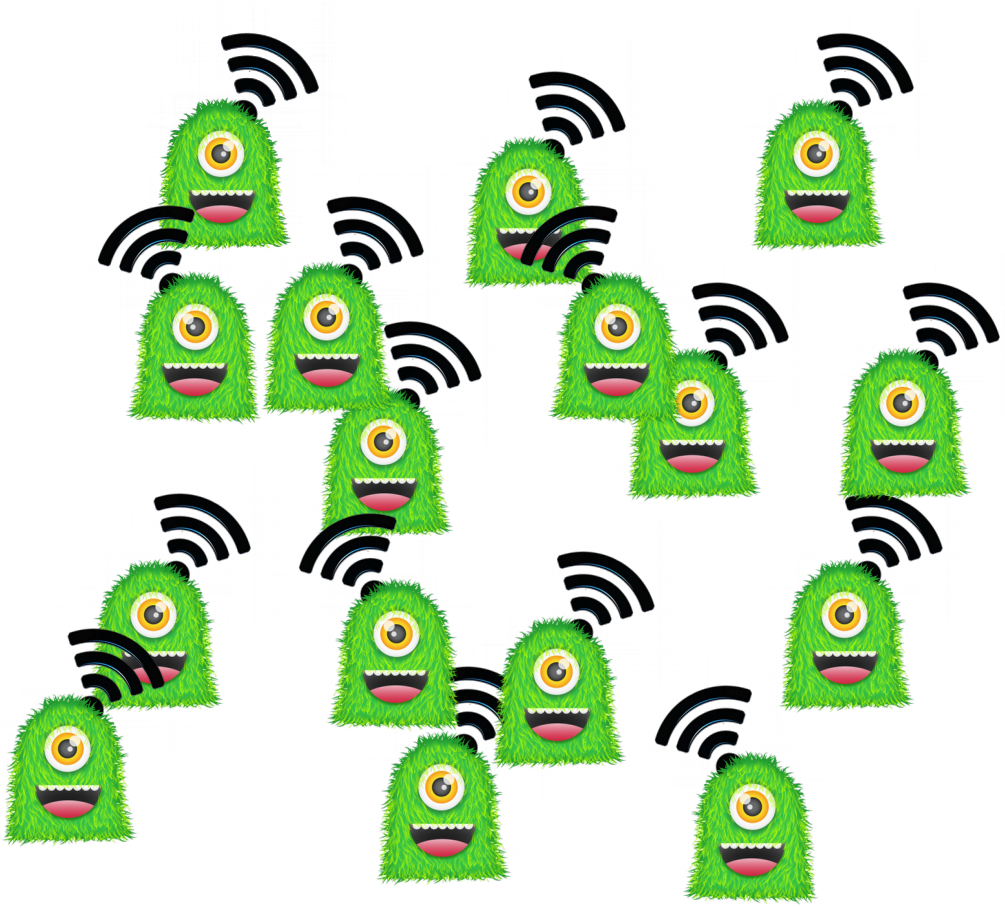

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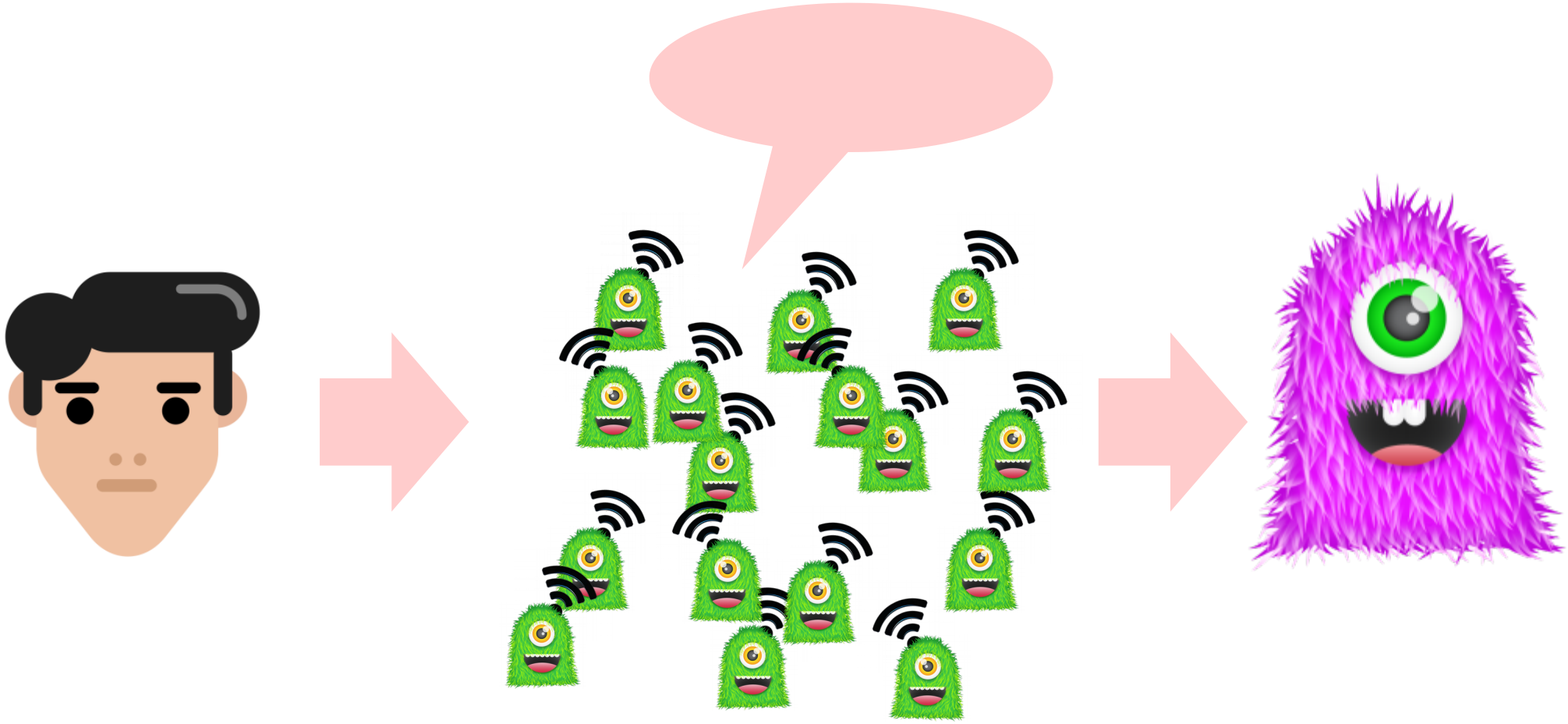
Let’s think about privacy



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My devices are sending and receiving data every two seconds, sometimes even when I sleep

Story Lab By Simon Elvery

Updated 3 Dec 2018, 7:24am

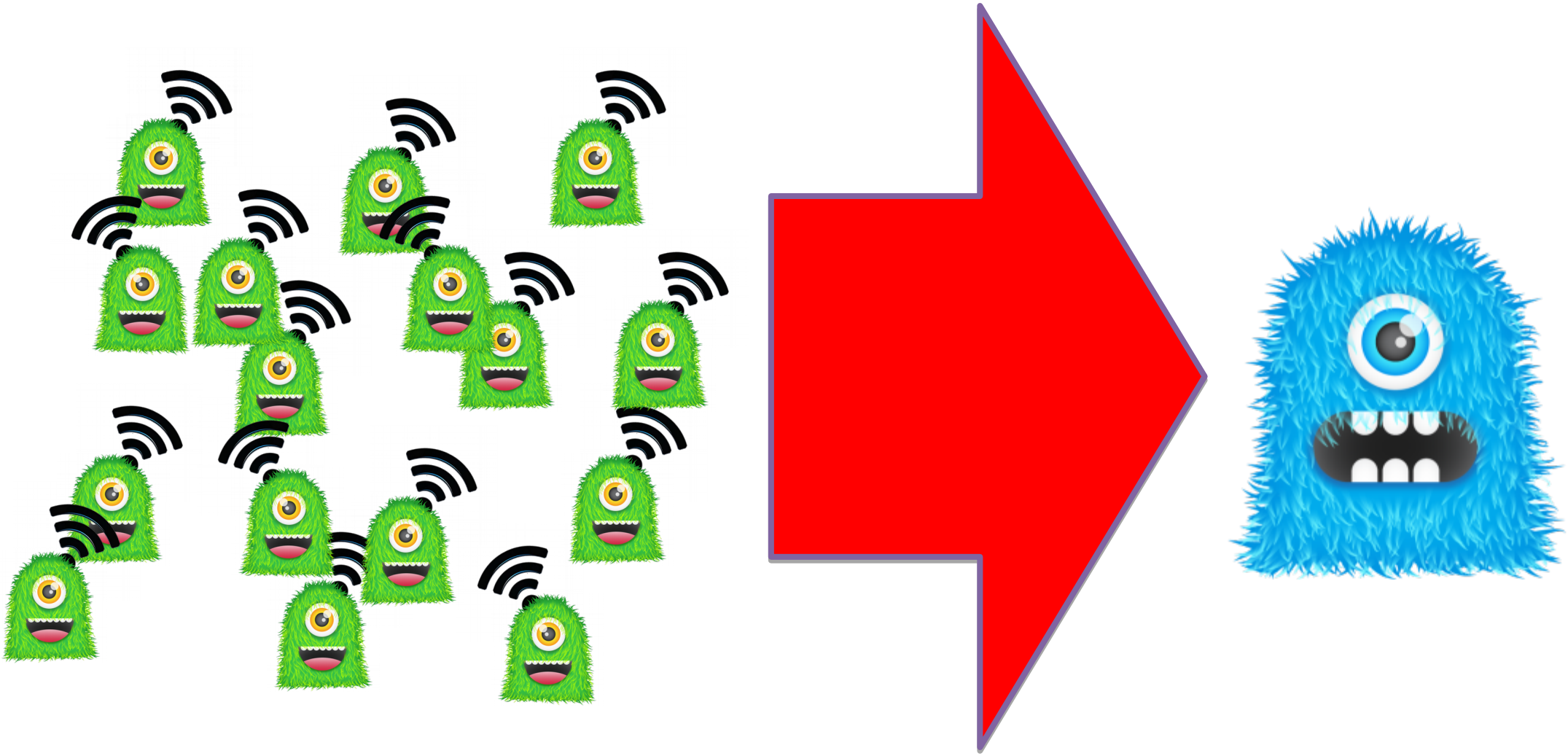
When I decided to record every time my phone or laptop contacted a server on the internet, I knew I'd get a lot of data, but I honestly didn't think it would reveal nearly 300,000 requests in a single week.

On average, that's about one request every two seconds.

In this instalment of the #DataLife project I'm going to take a broad look at what all those requests are doing and break down some details about what I've found in the data so far.

PHOTO: For the #DataLife project, Simon Elvery intercepted and recorded every bit of data sent from his phone and laptop. (ABC News: Tim Leslie and Ben Spraggon)

...And about DDoS



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Hacked IoT Devices Internet Services

Microsoft

IoT Signals

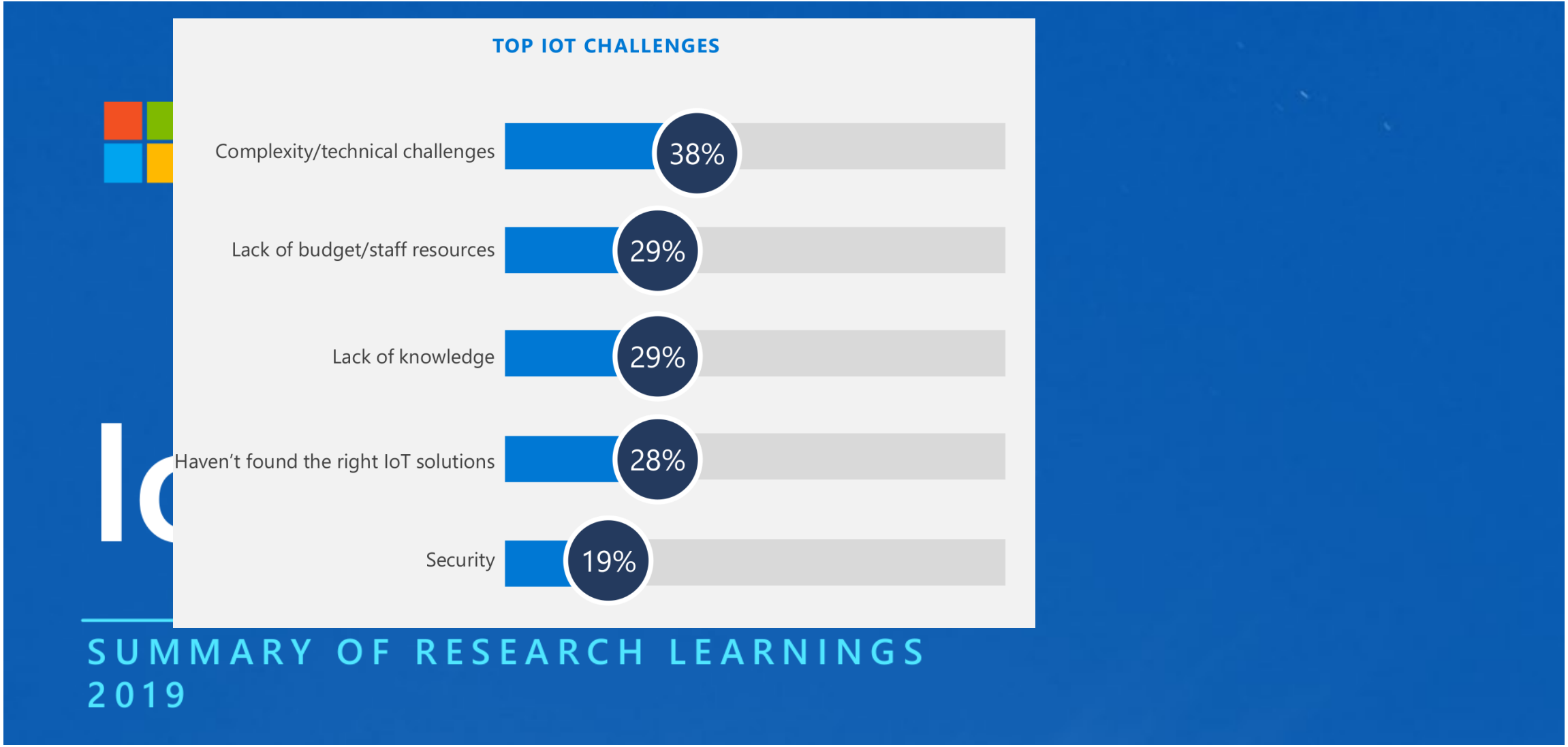
SUMMARY OF RESEARCH LEARNINGS
2019

Microsoft

IoT Signals

SUMMARY OF RESEARCH LEARNINGS
2019

Security concerns around IoT adoption are universal: 97% of companies are concerned about security when implementing IoT (though this is not hindering adoption). Collectively, the top security priority is



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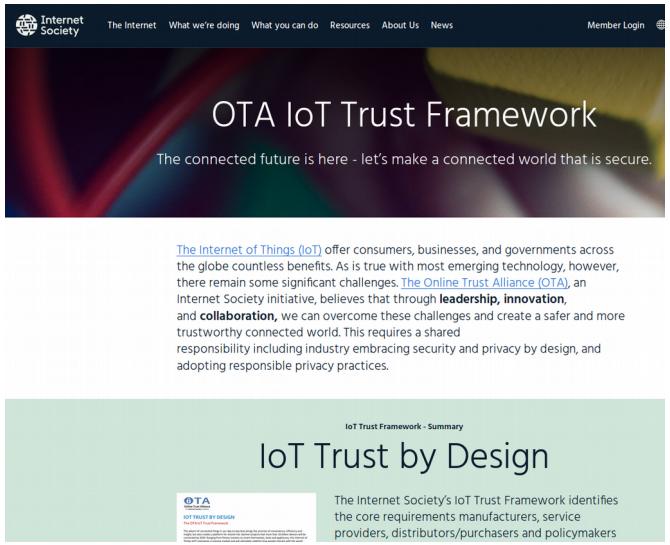
NEWS

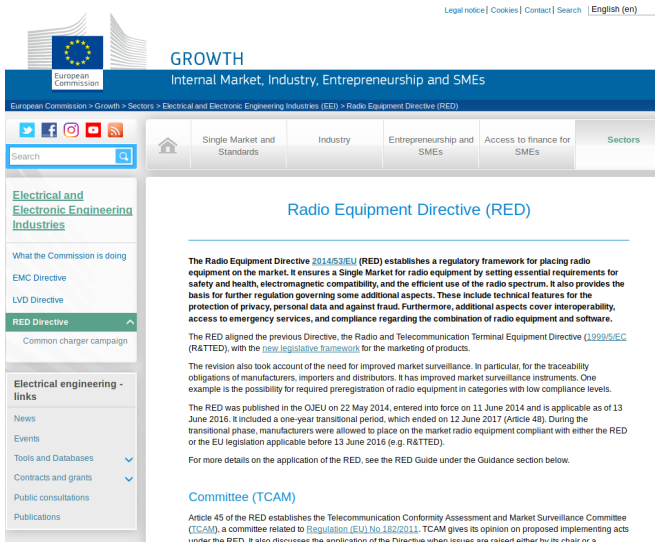
More than two-thirds of consumers are concerned about IoT device security

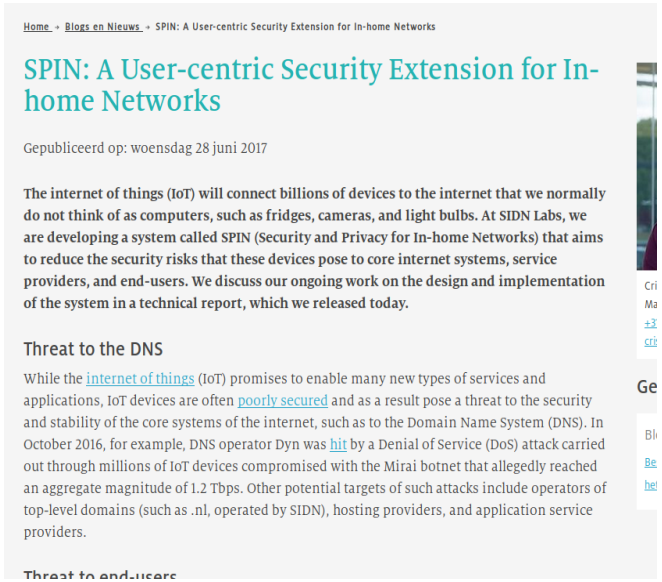
By **Sooraj Shah** - April 27, 2017

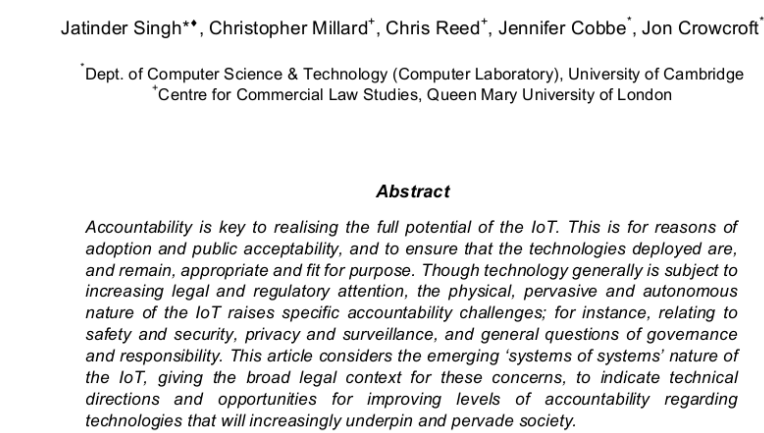
Source: Internet of business

Initiatives around the world, on many levels









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Adviesraad kabinet: verbod op onveilige 'slimme' apparaten

Joost Schellevis
redacteur Tech

ANP

Het kabinet moet onderzoeken of onveilige *internet of things*-apparaten geweerd kunnen worden van de markt. Daarvoor pleit de Cyber Security Raad, een adviesorgaan van het kabinet. In die raad zitten mensen uit het bedrijfsleven, de wetenschap en de overheid.

But what WE like is research

So let's focus on that!

IoT (Collaboration) projects at SIDN

- INTERSECT An Internet of Secure Things
- DINET DNS-Based Trust, Security, Accountability, and Privacy for IoT
- MINIONS Mitigating IOT-Based DDoS Attacks via DNS

Cleaning up the Internet of Evil things

https://www.ndss-symposium.org/wp-content/uploads/2019/02/ndss2019_02B-2_Cetin_paper.pdf

Paper by TUD, YNU, and NICT into the effectiveness of remediation strategies, such as notification and quarantining infected networks.

Tracked Mirai infections through several sources, and the rate of cleanup for several methods.

Cleaning up the Internet of Evil things: Mirai

- 87% of infections in broadband access networks
- 58-74% natural cleanup rate (no action taken) over several control groups
- 77% cleanup on email notification
- 92% cleanup on quarantine
- Only 5% reinfection rate after 5 months

Conclusion:

- Quarantining works best

- But please, do it right:
  - Specify issue and reason
  - Specify date and time
  - Specify what to do

The SPIN project at SIDN Labs

- Security and Privacy for In-home Networks

- Research and prototype of SPIN functionality:
  - Visualising network traffic
  - (Automatic) blocking of 'bad' traffic
  - Allow 'good' traffic

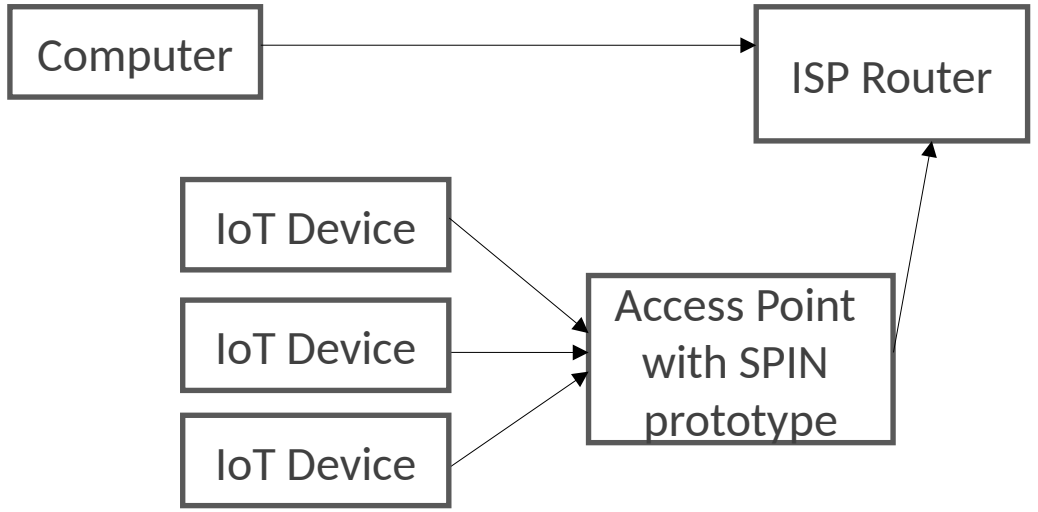
The SPIN project at SIDN Labs

- Open source in-home router/AP software that
- Helps protect DNS operators (like SIDN!) and other service providers against IoT-powered DDoS attacks
- Helps end-users controls the security of their home networks

Prototype built on OpenWRT

- https://spin.sidnlabs.nl
- https://github.com/SIDN/spin
- Currently working on better instructions for Raspberry Pi

prototype 2, GL-Inet hardware



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SPIN project focus change

- Renewed focus on research and analysis aspect

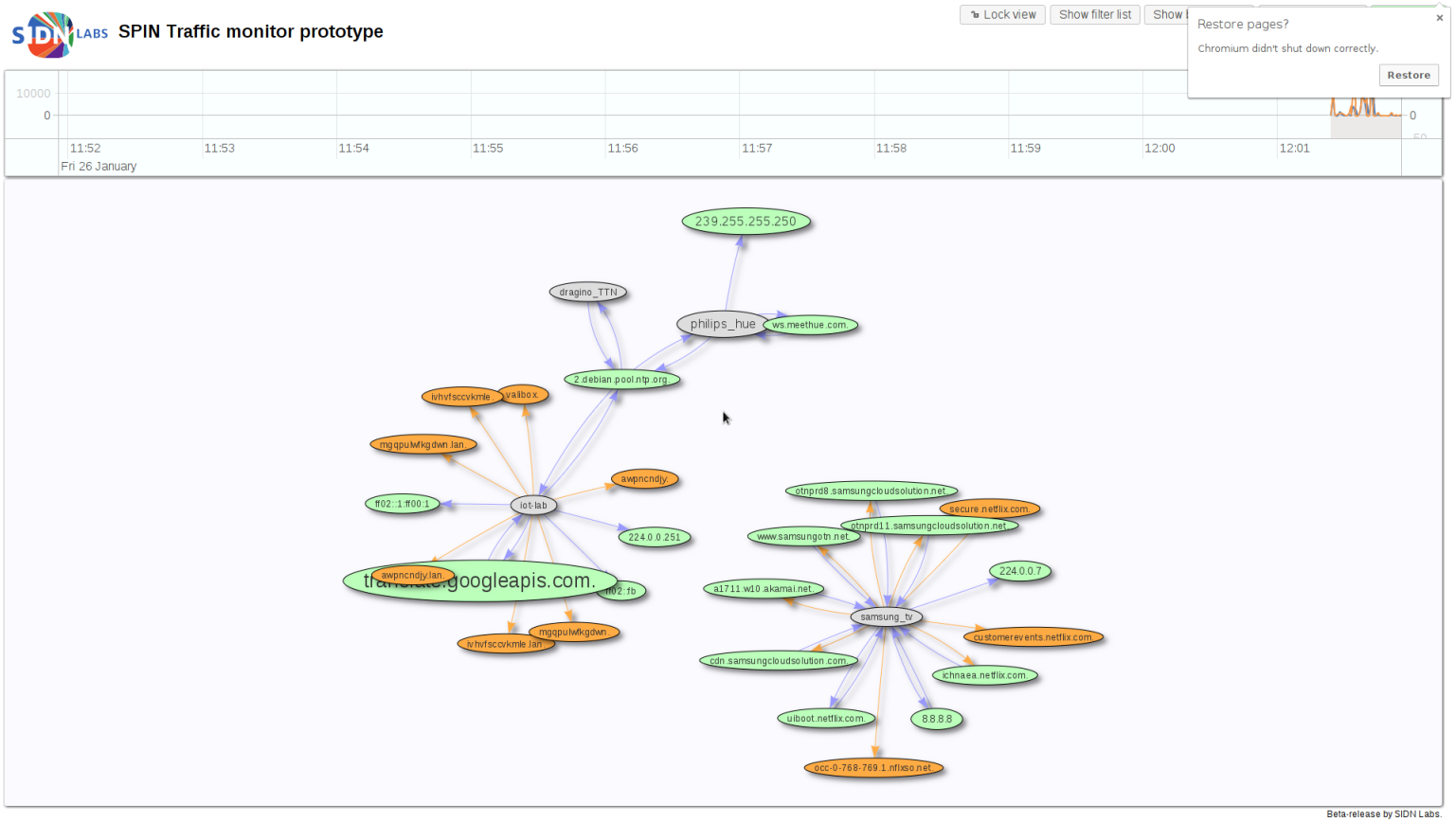
- Basic visualisation locally
- Sharing platform for further analysis (fully optional)

- Start out with other datasets:
  - Large dataset of honeypot data
  - Collected data from our lab devices

Running prototype: visualiser

- Shows DNS queries
- Shows data traffic
- User can block traffic based on source or destination, or both
- Download traffic from specific
- devices

- Next research topics:
  - In-depth device traffic analysis
  - Time-series based analysis



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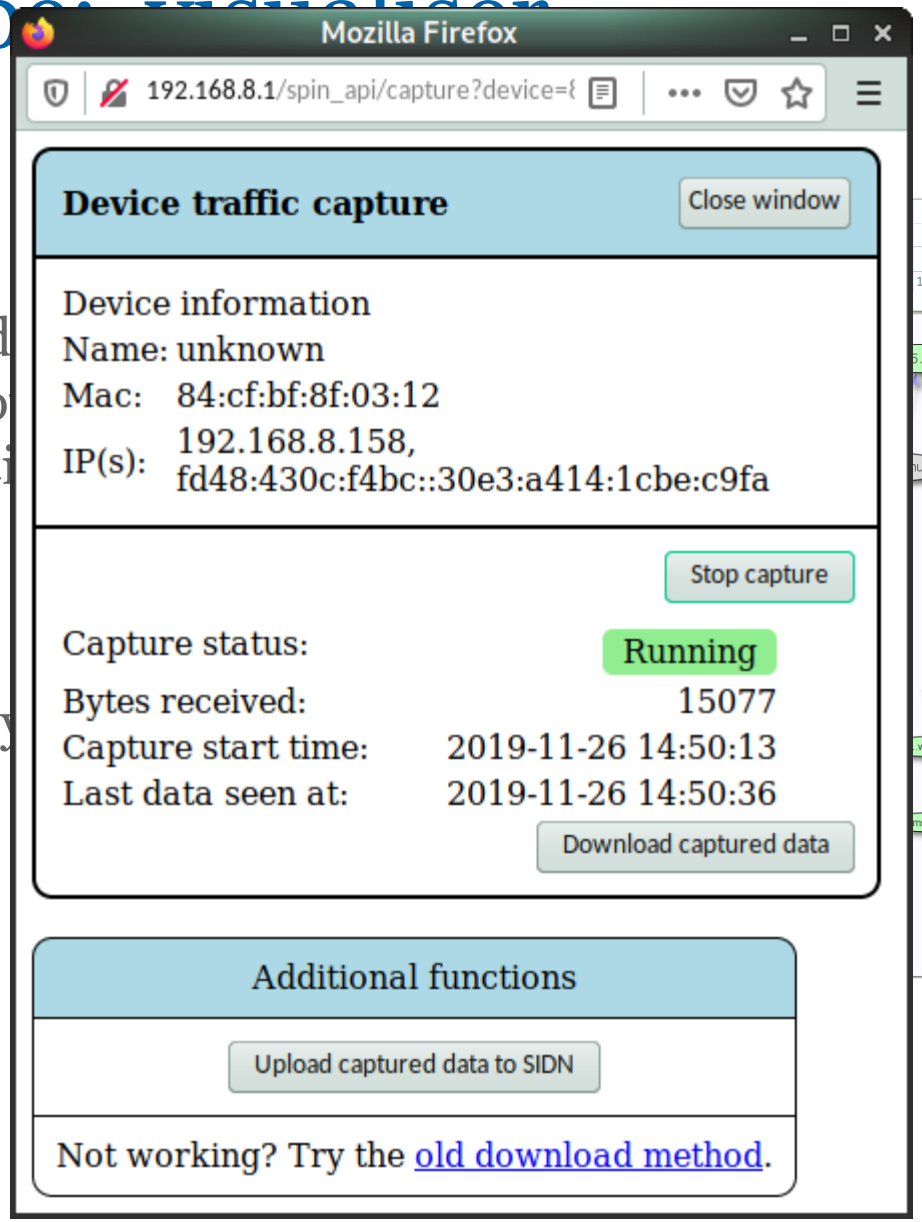

WIP: Initial high-over analysis

```
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Collected data for Tuya_2019-09-08_22-55-40.pcap
Total number of packets in pcap: 36233
Packet types:
    ip: 33339
    icmp: 3
    arp: 2887
    wauth: 4
    unknown: 0
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
First packet seen:      2019-09-08 22:55:47
Last packet seen:       2019-09-09 22:58:47
Duration of trace:      24:02:59
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
IP Packet summary:
```

source	destination	proto	port	#sent_packets	#sent_bytes	#recv_packets	#revc_bytes
0.0.0.0	255.255.255.255	UDP	67	2	700	0	0
192.168.8.1	192.168.8.211	UDP	68	6	2088	4	1400
192.168.8.211	255.255.255.255	UDP	6666	28859	6262403	0	0
192.168.8.211	52.58.217.66	TCP	1883	2915	161970	1470	83267
192.168.8.211	18.194.70.37	TCP	80	46	5356	30	3726
192.168.8.211	192.168.8.1	UDP	53	2	148	2	228
192.168.8.211	224.0.0.1	IGMP	0	1	46	0	0
52.29.251.104	192.168.8.211	TCP	15257	1	54	1	54

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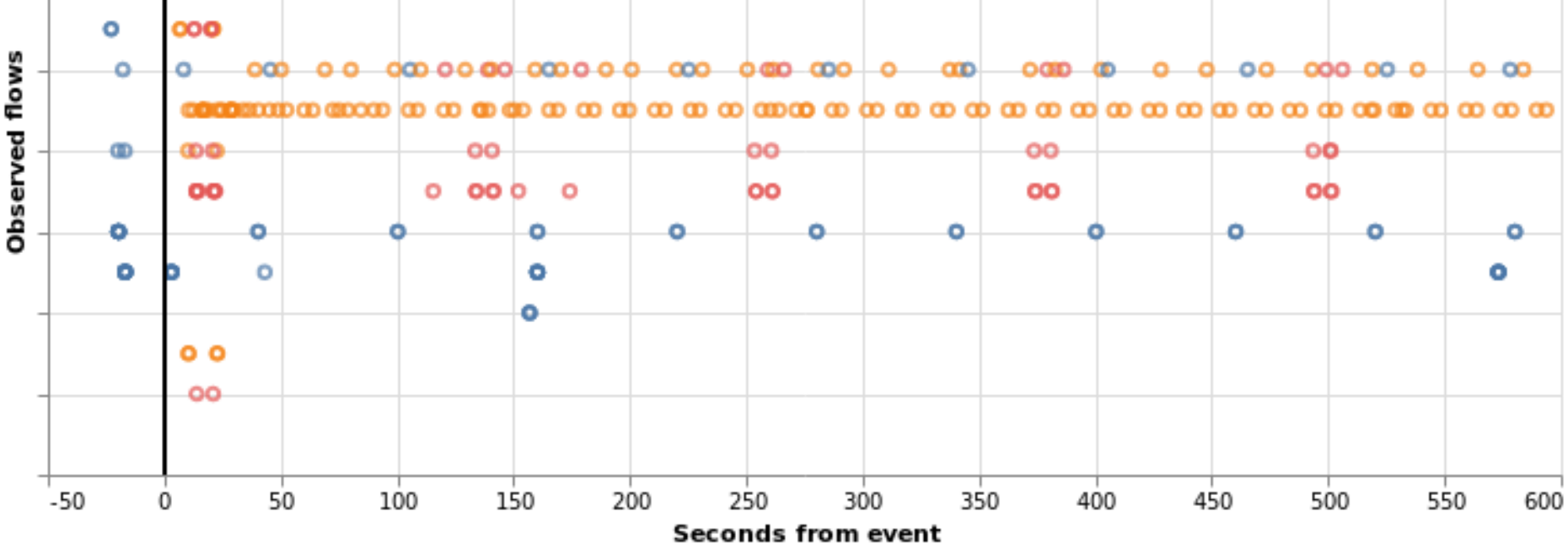
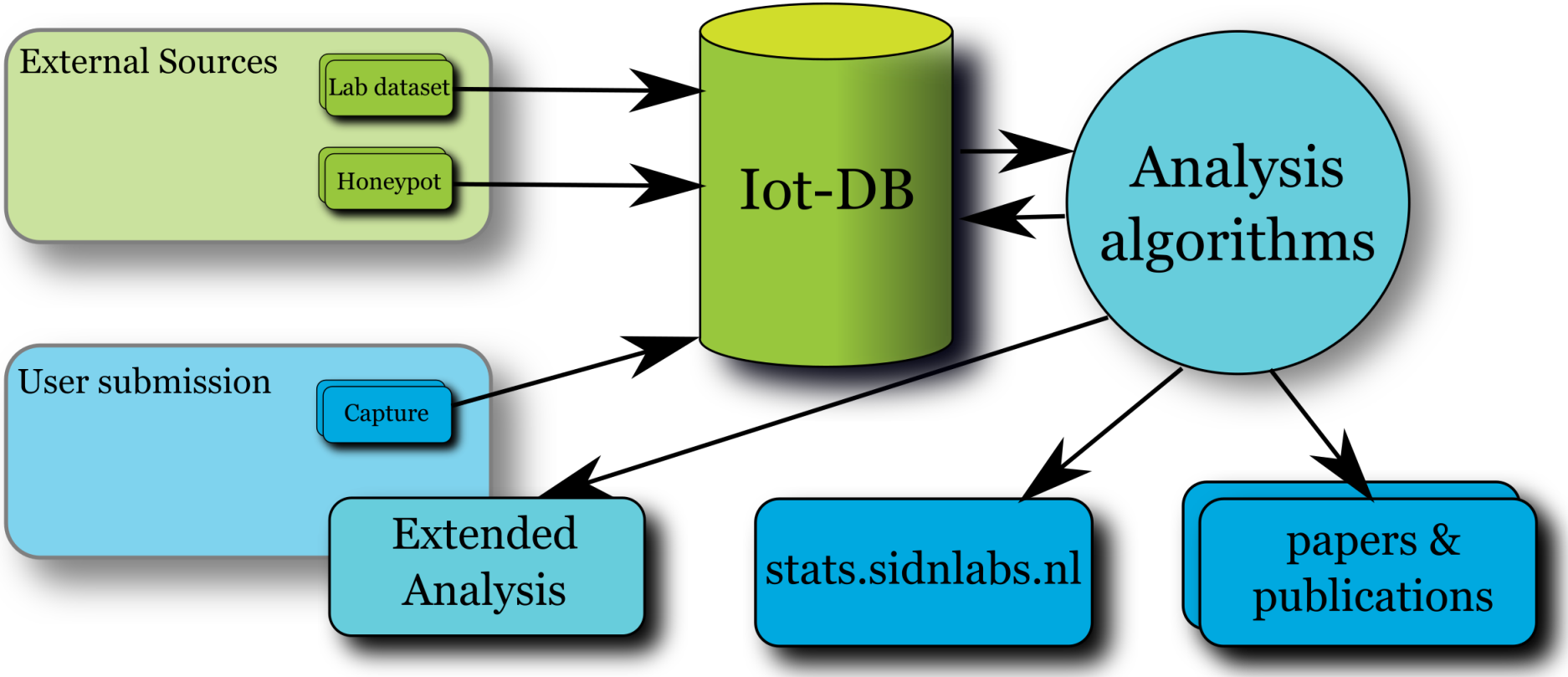


Filter_event power_on

power_on
switch_off
switch_on
download_stop
power_off
turned_off

WIP: Time-series analysis

Potential goal: “IoT-DB”



Thank you for your attention!

Any questions?

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