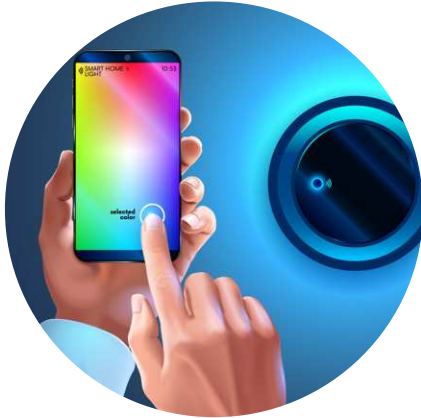


Consumer IoT Devices Privacy Implications and Mitigations

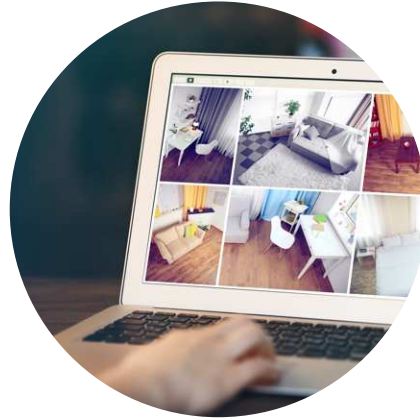
Anna Maria Mandalari

Research Associate, Imperial College London





**What if we are exchanging
privacy for gimmicks and
minor convenience?**



**What is IoT exposing when
it comes to privacy in a
Smart Home?**



**What might this mean for the
future?**

1080P
FULL HD



Wansview WiFi IP Camera, 1080P
Elder, Pet Camera Monitor with N
Tilt Zoom, Works with Alexa (Whi

Buying a product



Becoming a product



roducing Echo Show 8 | Stay in
i with the help of Alexa, Charcoal

★★★★☆ ~ 11,234

£79⁹⁹ £119.99

✓prime FREE One-Day

Why were we interested in this?

They may listen to you
(e.g., smart speakers)



- They can (by definition) access the Internet and therefore may expose private information
- Lack of understanding on what information they expose, on when they expose it, and to whom
- Lack of understanding of regional differences (e.g., GDPR)

What
Smart TVs)



Smart TVs collect data about what you watch with a technology called ACR. Here's how to turn it off.

Smart TV Snooping Features

Looping Features



**What is IoT exposing when
it comes to privacy in a
Smart Home?**

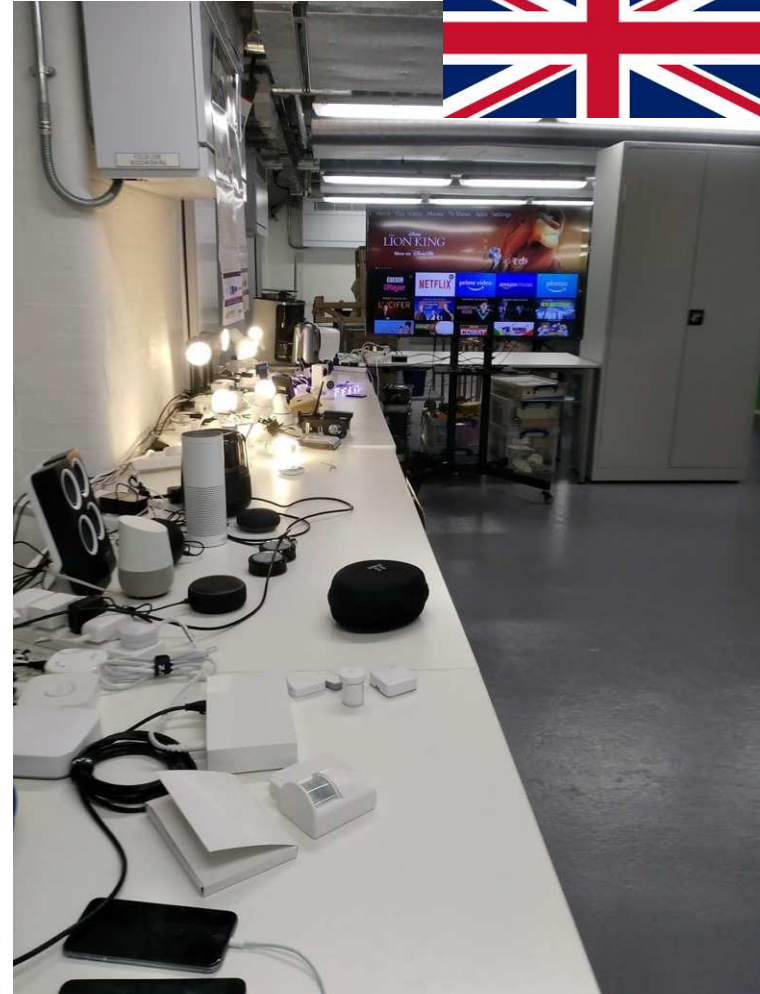
Goal of Research

What is the destination of IoT network traffic?

What information is sent?

Does a device expose information unexpectedly?

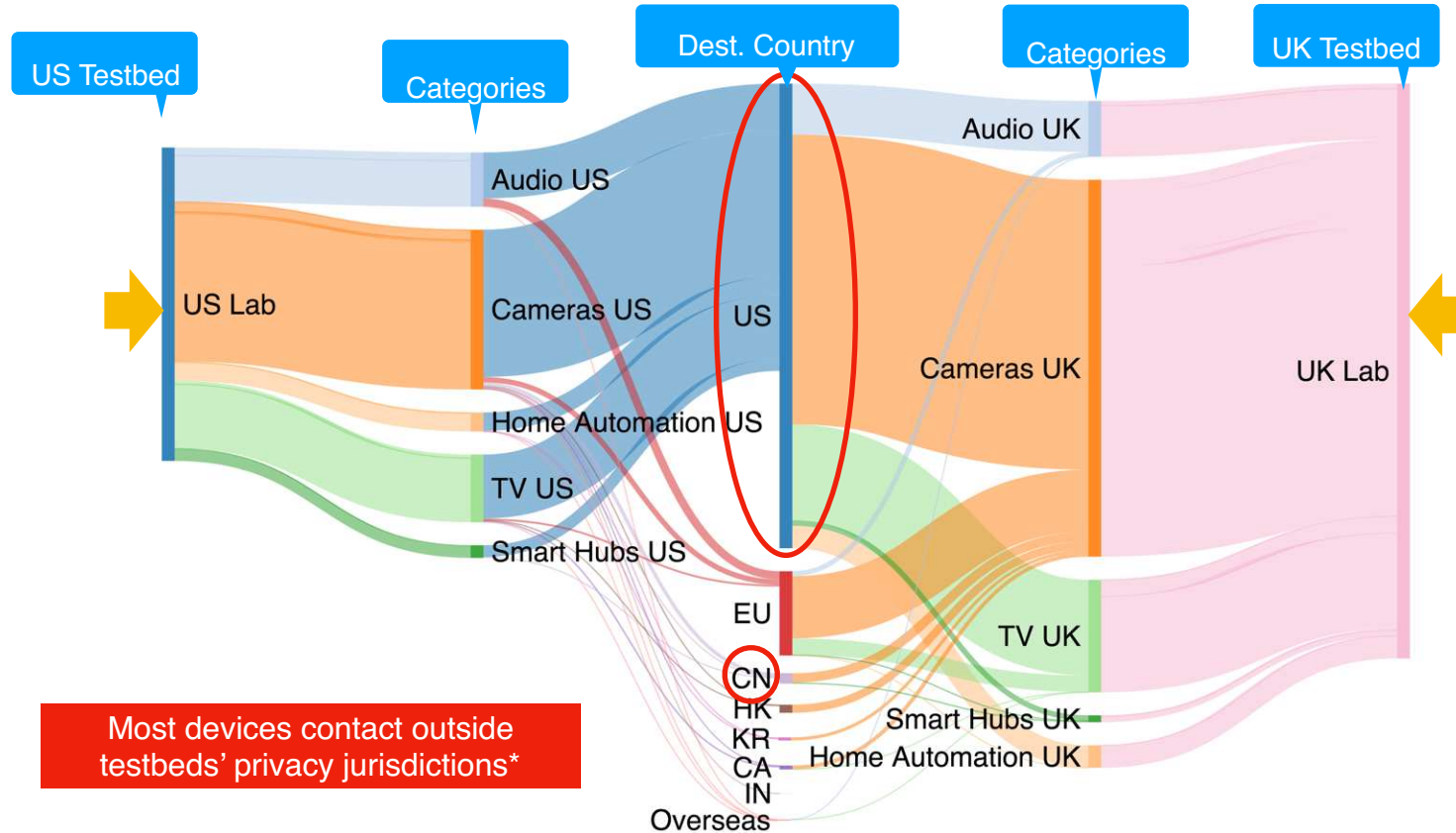
123 devices in
two different countries





11/24/2019 09:52:22

Most traffic goes beyond Europe



Cases of Unexpected Behaviour



Popular doorbells

Video recording on detected motion (cannot be disabled)



Popular smart TVs

Contact **Netflix**, **Google**, and **Facebook** unexpectedly



Alexa-enabled devices

Frequently falsely triggered (e.g. "I like **Star Trek**")

/// Other notable cases of activities detected when idle

// Cameras reporting **motion** in absence of movement

// Devices spontaneously **restarting** or reconnecting

Are Smart Speakers Listening to Us?



**Misactivations from smart speakers
between 2 and 19 times per day**

**8.44% of activations
occurred consistently,
others random**

**57% (50%) of destinations of the
US (UK) devices are not first-party**



Why is this a problem?



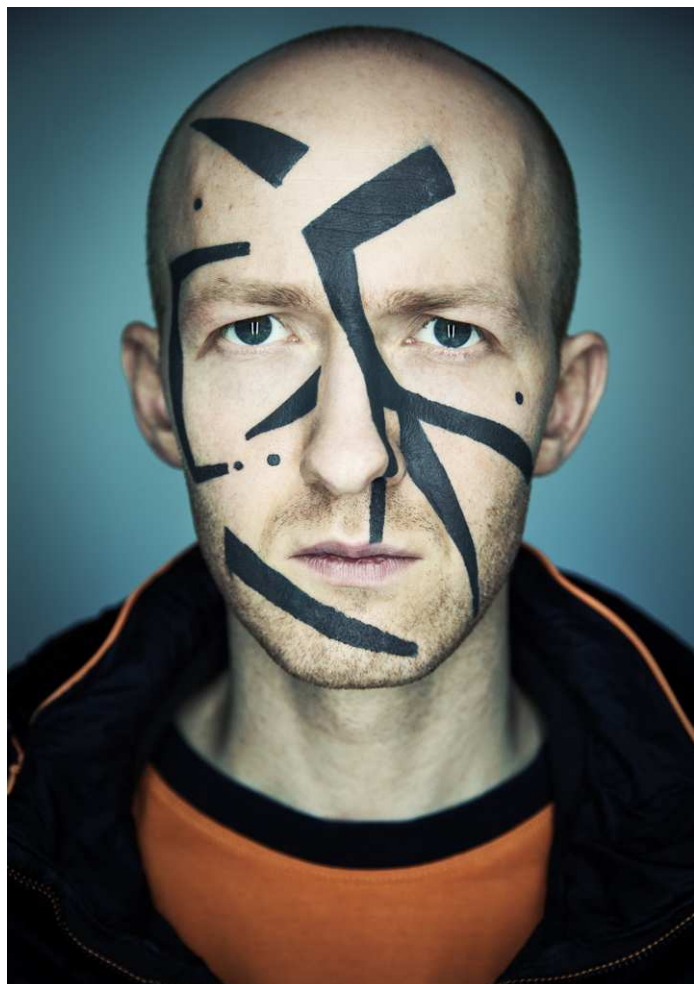
Profiling



Mass-influence

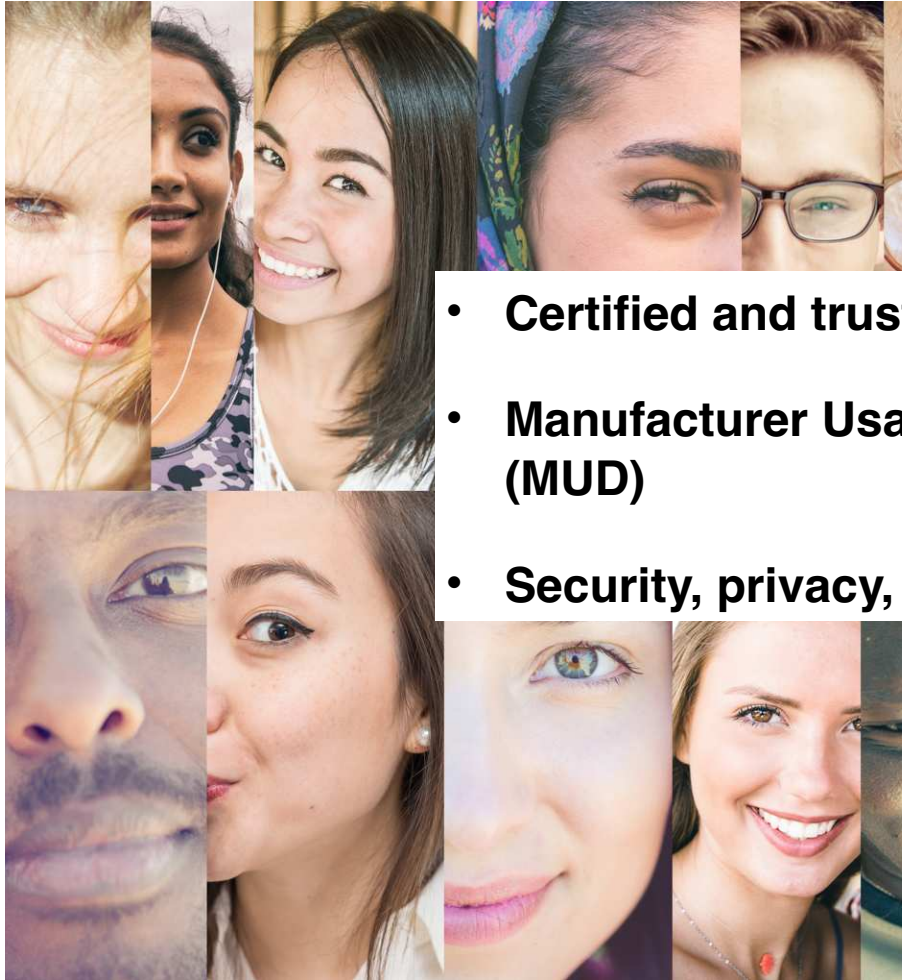


User emotion

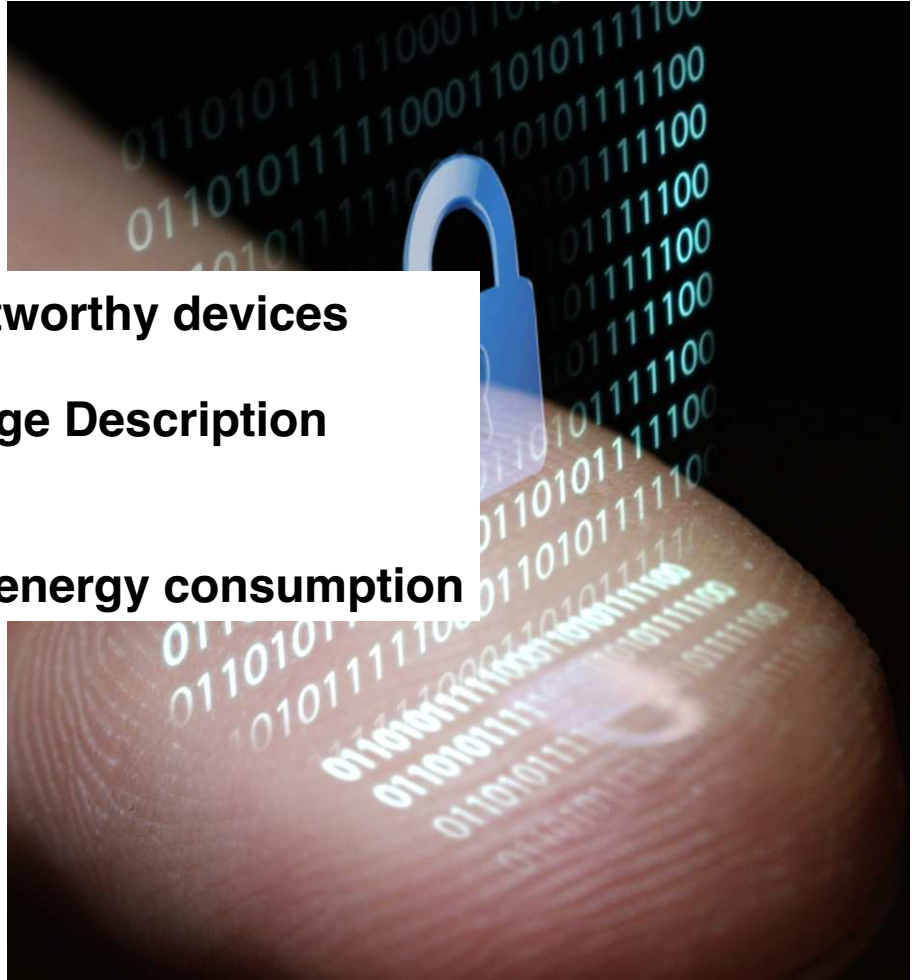




**What might this mean
for the future?**



- **Certified and trustworthy devices**
- **Manufacturer Usage Description (MUD)**
- **Security, privacy, energy consumption**



In 10 years... Databoxes in every home

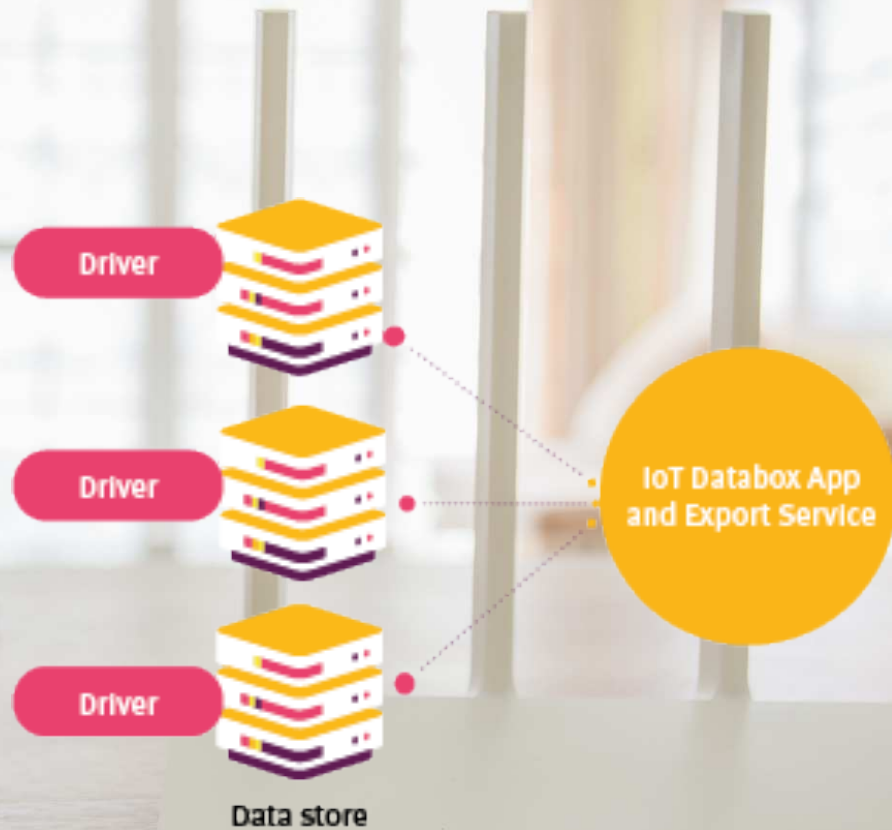


Solutions at the edge

/ Generalizable

/ Self adaptive

/ Accurate IoT blocker



A woman and a young girl are sitting on a light-colored sofa. The woman, on the right, is wearing a white t-shirt and blue overalls, and is gesturing with her hand as if speaking. The girl, on the left, is also wearing a white t-shirt and blue overalls, and is looking towards a smart speaker. The smart speaker is a tall, cylindrical device with a grey body and a blue light ring at the top, sitting on a white surface. The background is a bright, airy room with large windows and light-colored curtains.

**Conclusion: it is not all
bad!**
But we need regulations

Thank you

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