# FACE-PALM AND CARRY ON

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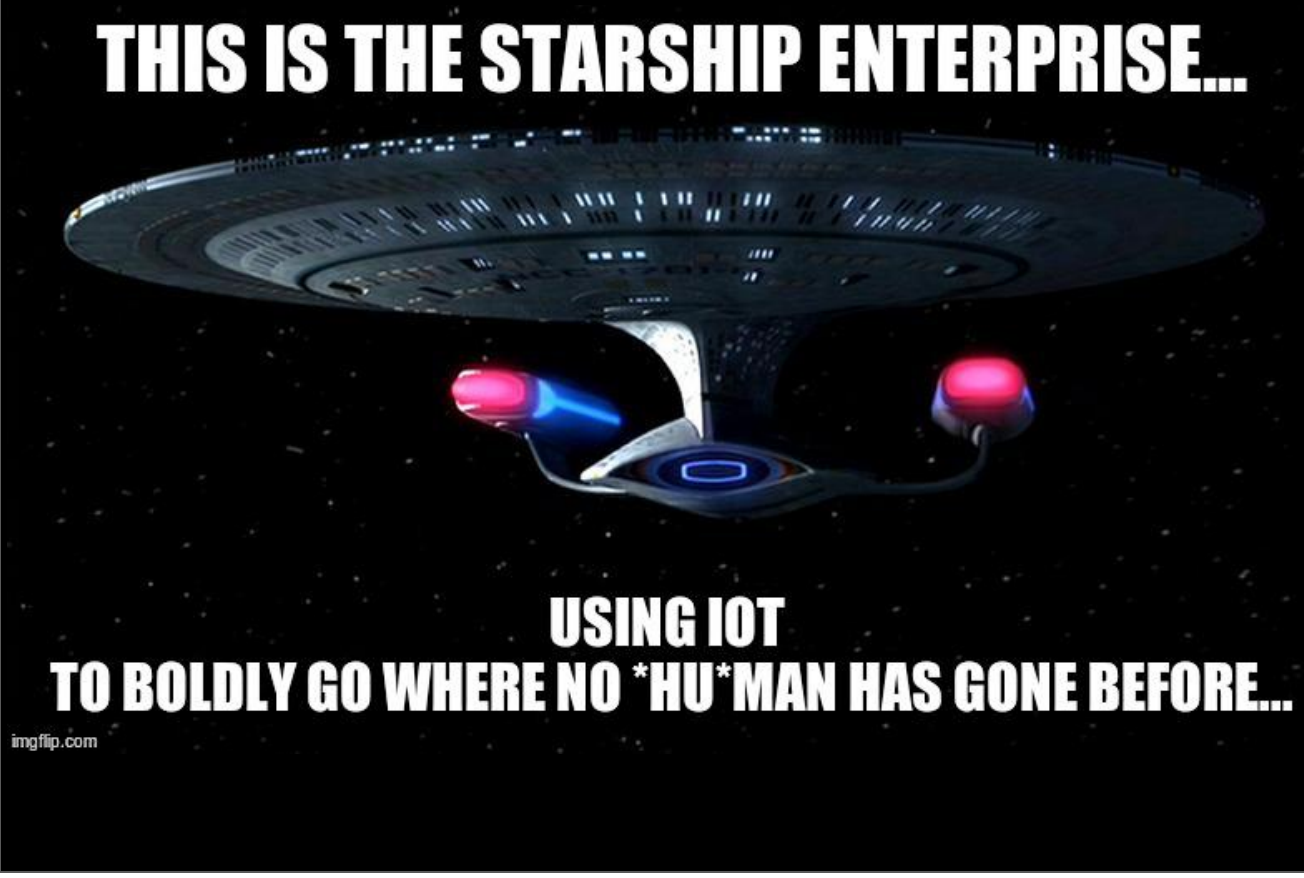
## A Tale of I's, O's and T's

Sig-C, April 9, 2020

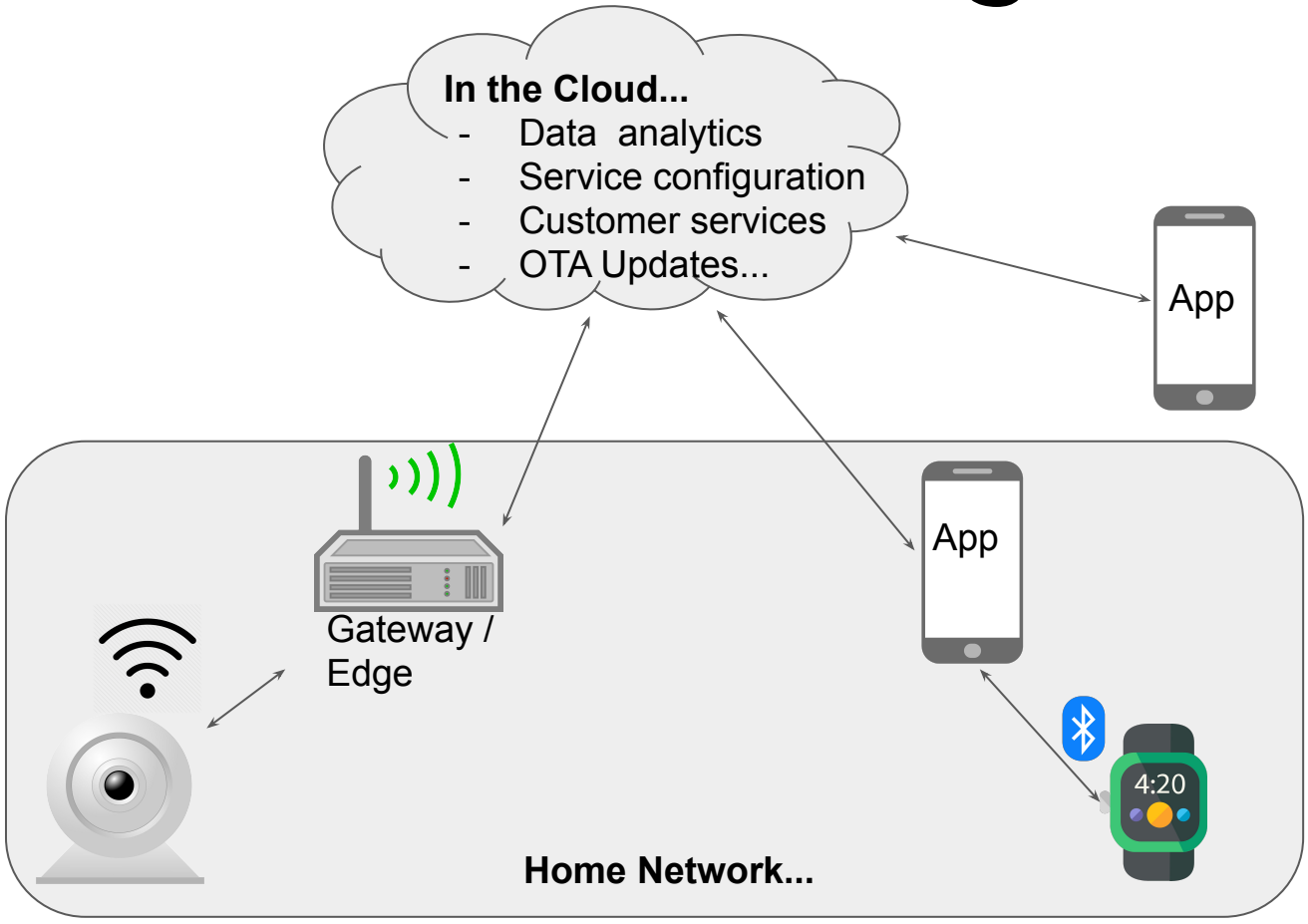
@jennjanesko



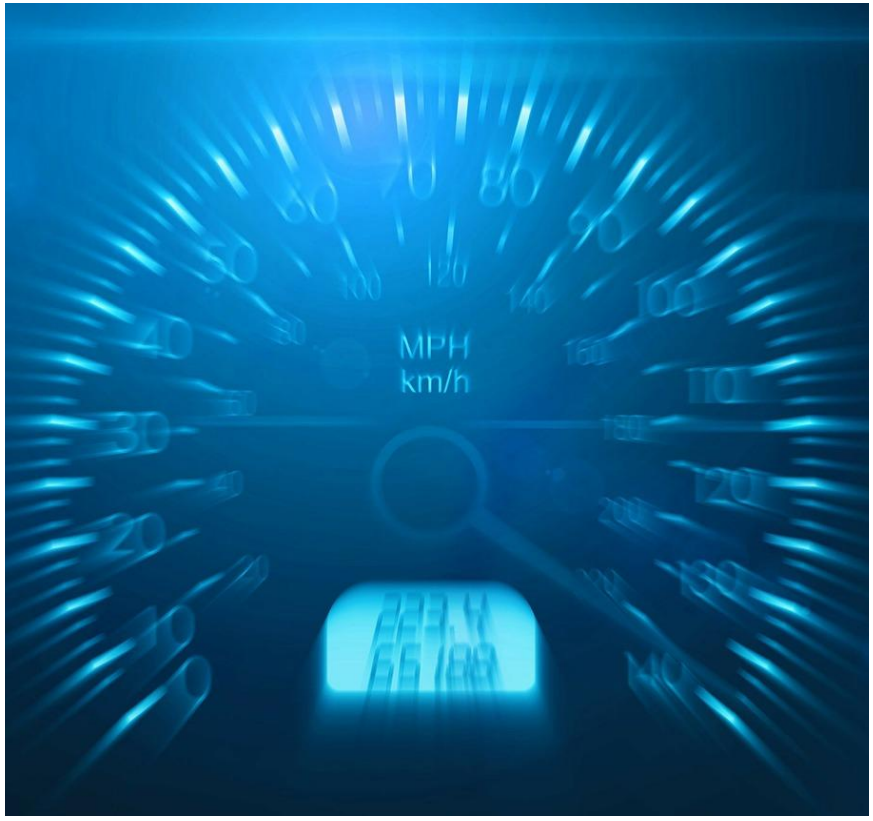

**Star Trek:**
**The Next Generation**

- Replicator
- Warp Drive
- “Computer...”
- Transporter
- Holodeck
- Cloaking Devices
- Medical Bay
- The Borg
- Data...

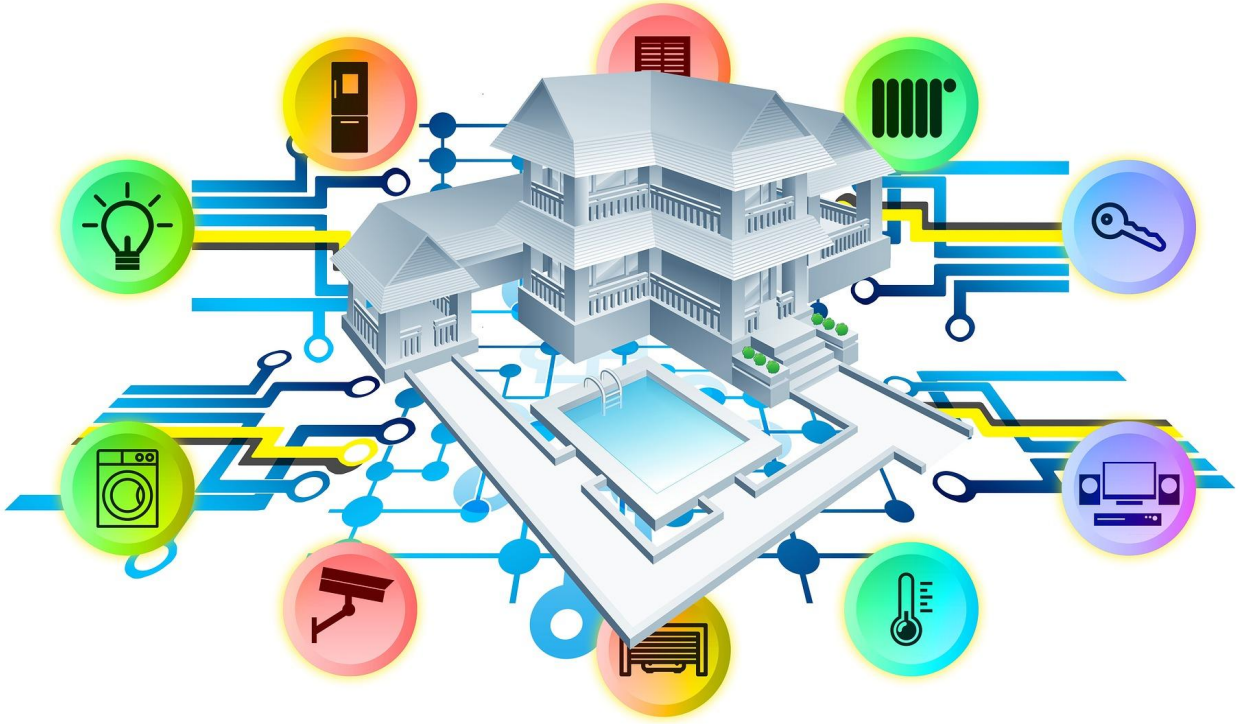
# Internet of Things



“Tea. Earl Grey. Hot.”




”Warp …“

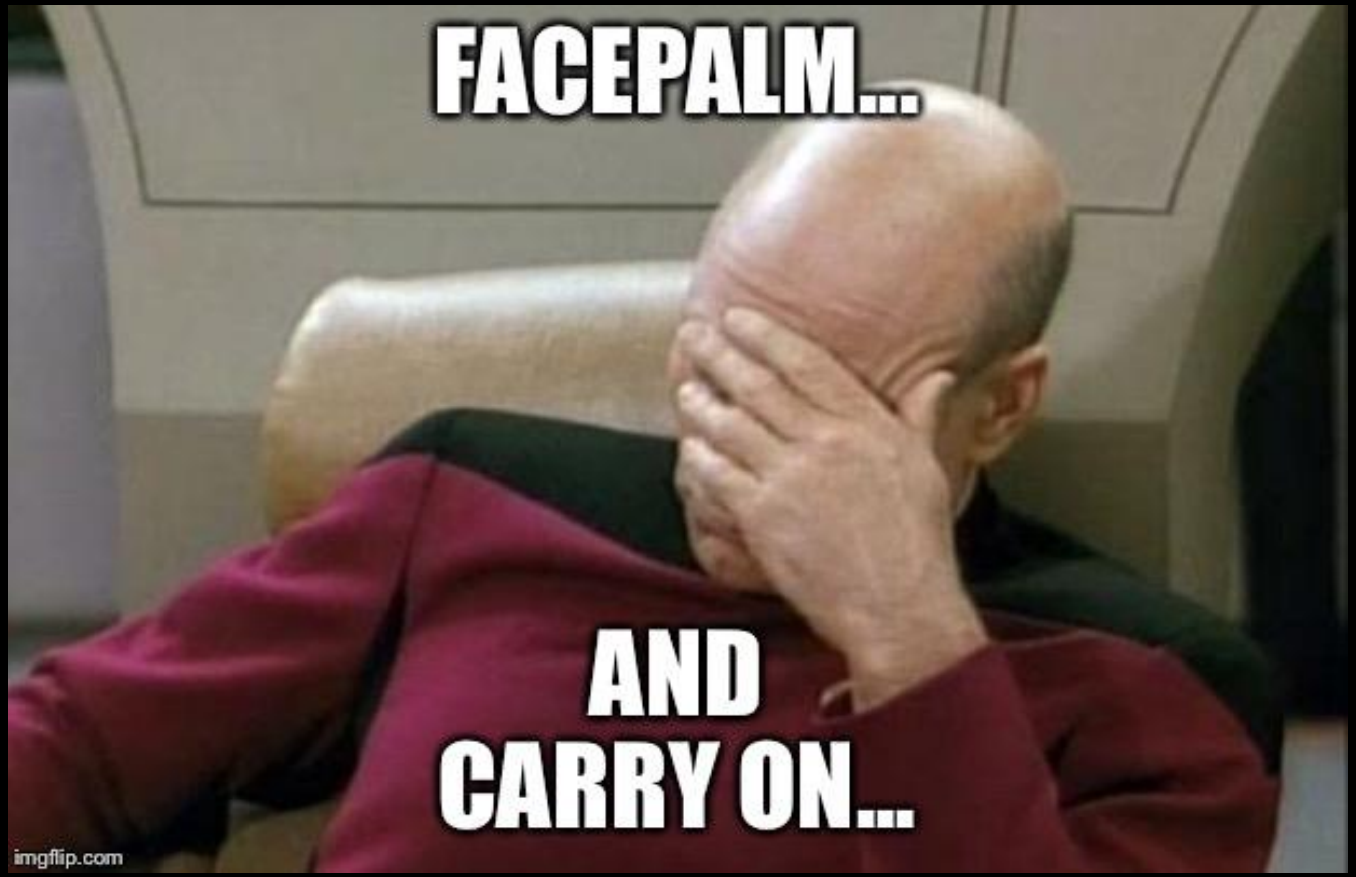


”Computer . . .”

# Software Security in IoT Improving?

- Scope:
  - 4000+ Firmware
  - 22 Vendors
  - 15 years
- General Result:
  - No positive trends

- *Data from analysis available*


FACEPALM...
AND
CARRY ON...
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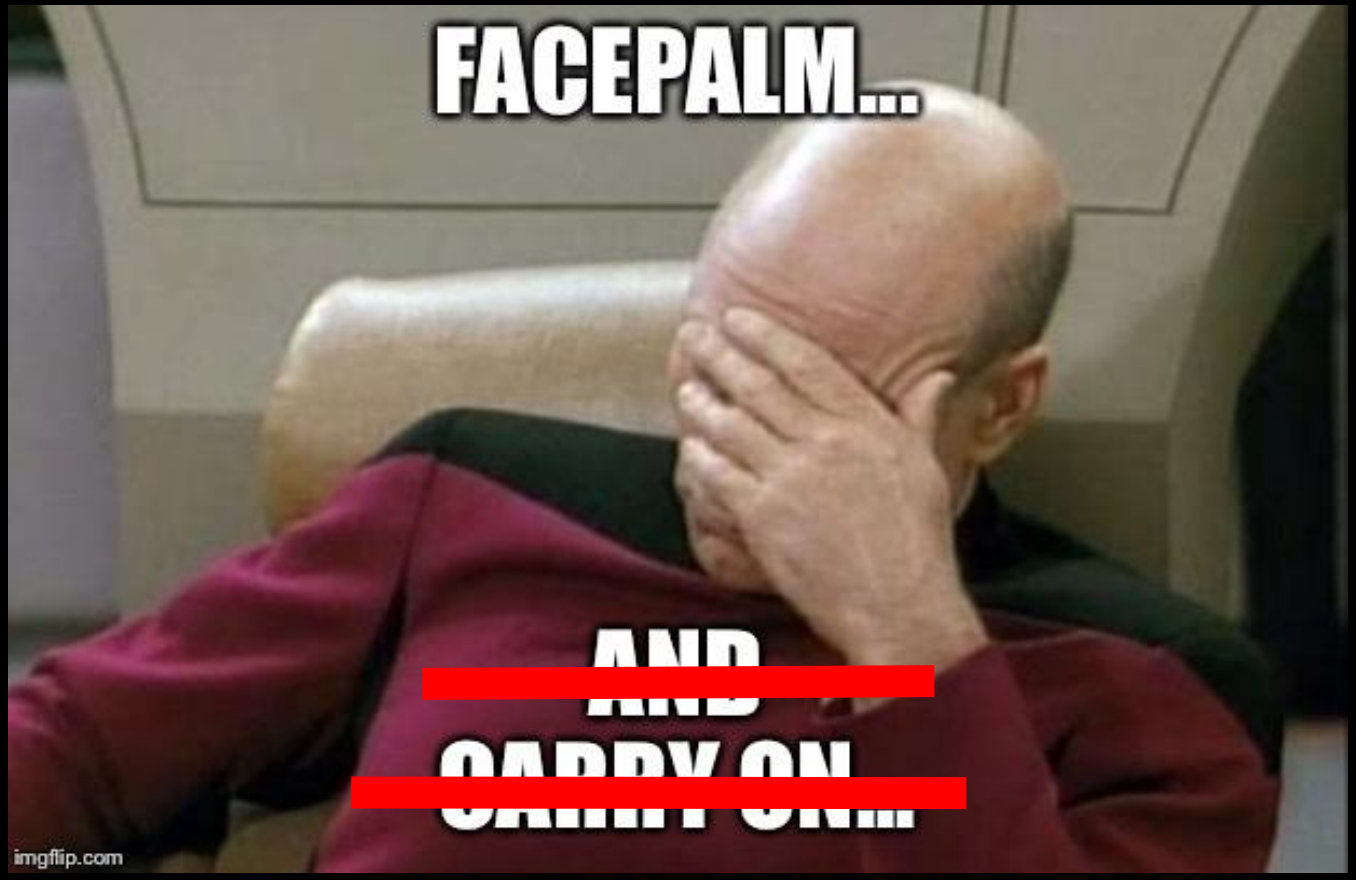
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AND
CARRY ON...
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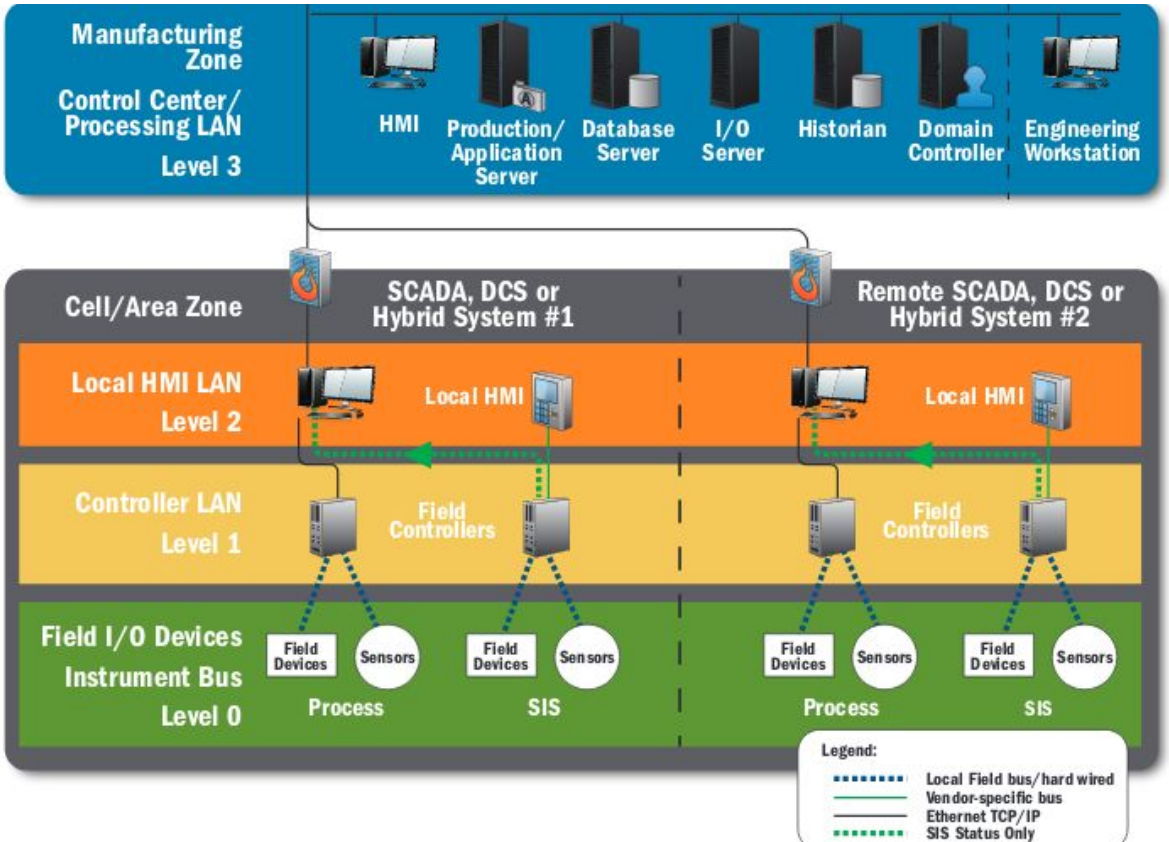
# Operational Technology (OT) → IIoT

- Airgapped → Connected

- Solutions:
  - Remote
  - Mobile/ web apps
  - Cloud

- Breach impacts:
  - Environmental
  - Death / Injury
  - Damage



# OT: Legislation and Legal Directives

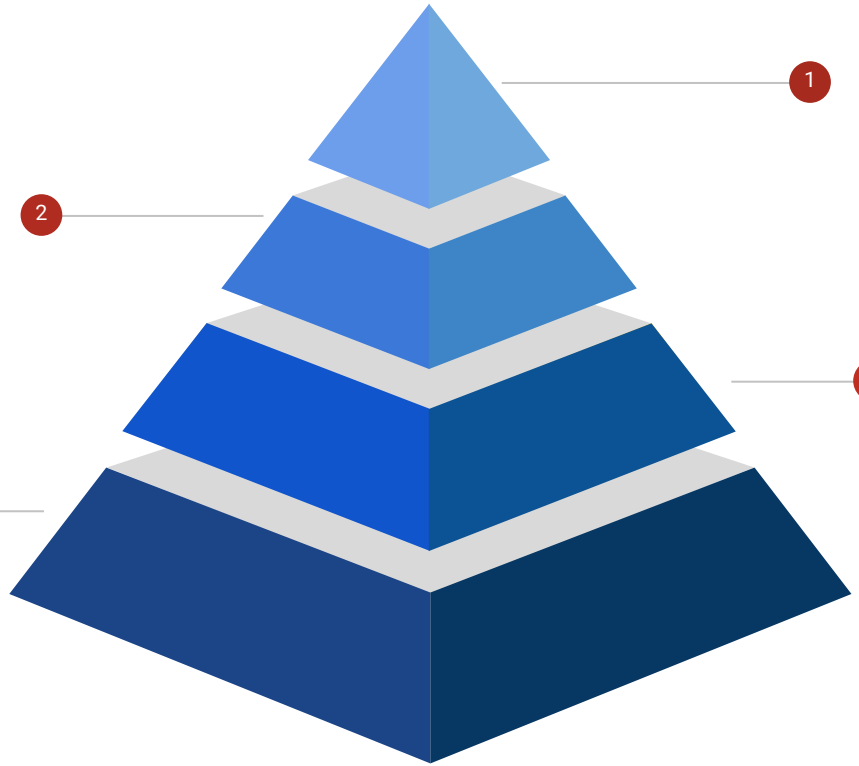
| USA | Europe | Singapore |
| --- | --- | --- |
| - Energy Policy Act of 2005<br><br>- NERC-CIP Standards | - European Programme for Critical Infrastructure Protection (EPCIP) - 2004<br><br>- Germany: 2015 Amendment to Energiewirtschafts-gesetz | - Singapore's Operational Technology Cybersecurity Masterplan (2019) |

# OT Roles

Asset Owner | System Integrator | Product Supplier


IEC 62443

# Responsibility for OT Security: Asset Owners



## Security Audits

1

Site Assessments
Vulnerability Analysis (!)
Penetration Testing (!)

## Monitoring

2

IDS
Canaries
Threat Hunting

## Access Control

3

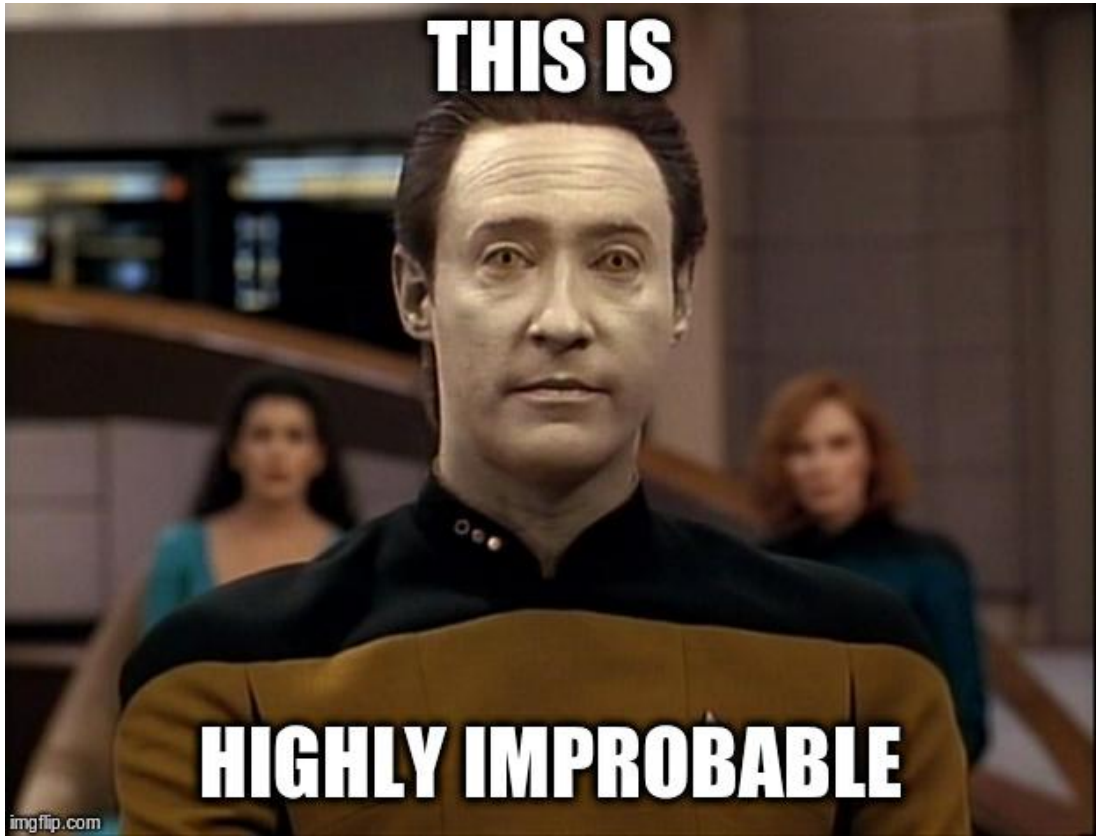
Firewalls
DMZs
Diodes
Jump Hosts
Segmentation

## Process

4

ISMS
Concepts
Procedures
Documentation!

# OT Legislation: Is it perfect?



# OT Roles in IoT

| | Asset Owner | System Integrator | Product Supplier |
|---|---|---|---|
| **Medical (IoMT)** | | | |
| **Connected Vehicle (V2X)** | | | |
| **Consumer IoT** | | | |

# OT Roles in IoT: Medical

| | Asset Owner | System Integrator | Product Supplier |
|---|---|---|---|
| **Medical (IoMT)** | Humans | Hospital, Doctor‘s Office, Medical Center | Medical device supplier, component supplier |

- USA → Food and Drug Administration
- EU → Medical Devices Regulation

# OT Roles in IoT: Automotive

| | Asset Owner | System Integrator | Product Supplier |
|---|---|---|---|
| **Connected Vehicle (V2X)** | Humans | Auto Dealer<br>Service Stations<br>Relatives/Friends with Skills | OEM, ECU Supplier |

- ISO 21434
  - “Road vehicles – Cybersecurity engineering”
- Related standards
  - ISO 26262 (safety)
  - SAE J3061 (cybersecurity)

# OT Roles in IoT: Consumer

| | Asset Owner | System Integrator | Product Supplier |
|---|---|---|---|
| **Consumer IoT** | Humans | Package Instructions, Youtube, Quora, StackOverflow... | IoT device maker, component supplier |

# Legislation for Asset Owners?

# Legislation for Product Suppliers?

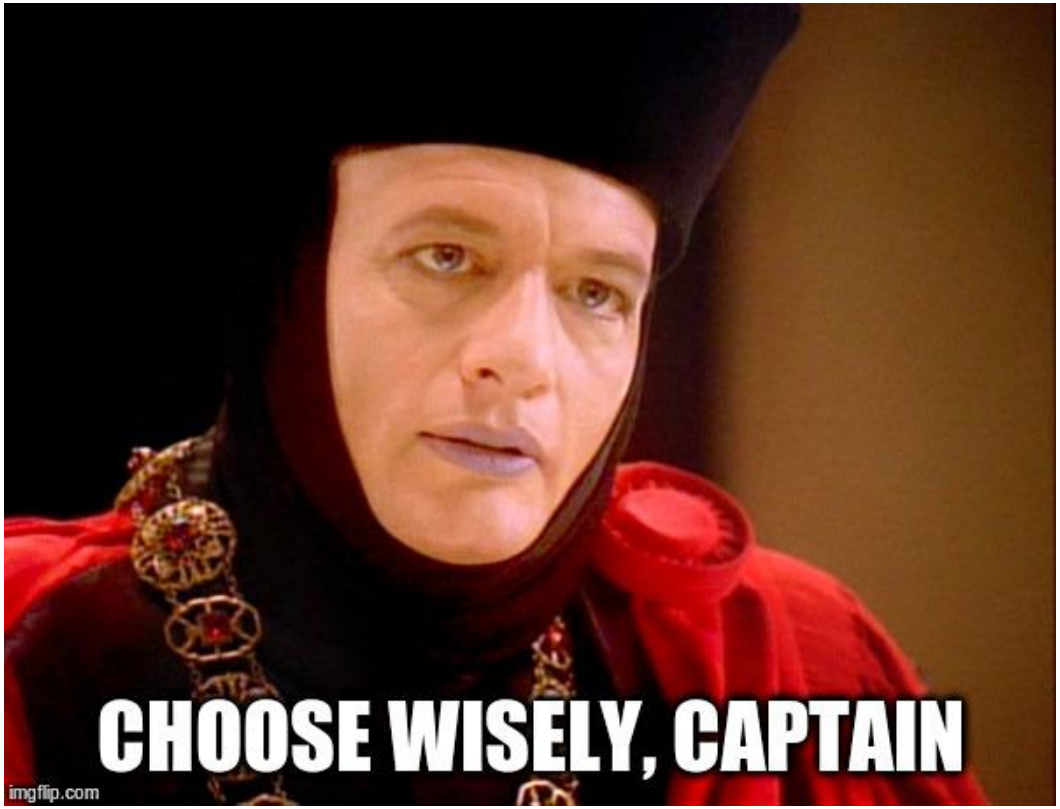
**Legislative Examples**

- Existing:
  - California: SB-327
- Proposed:
  - USA:
    House Bill 1668
  - UK:
    CoP for Consumer IoT Security
  - Germany:
    BSI TR-03148 - Router Security

**Legislative Inhibitors**

- Lack of perceived criticality (changing)
- Lack of expertise (partial)
- Impact on business (especially small and micro)
- Monitoring costs

# Standards? (YAS?)




-OWASP Internet of Things Security Recommendations

-UK Code of Practice for Consumer IoT Security

-Enisa Good Practices for the Security of IoT

-CSA Future Proofing the Connected World

-IoT Security Foundation Publications

-GSMA IoT Assessment IoT Security Guidelines

-CIS Controls: IoT Companion Guide

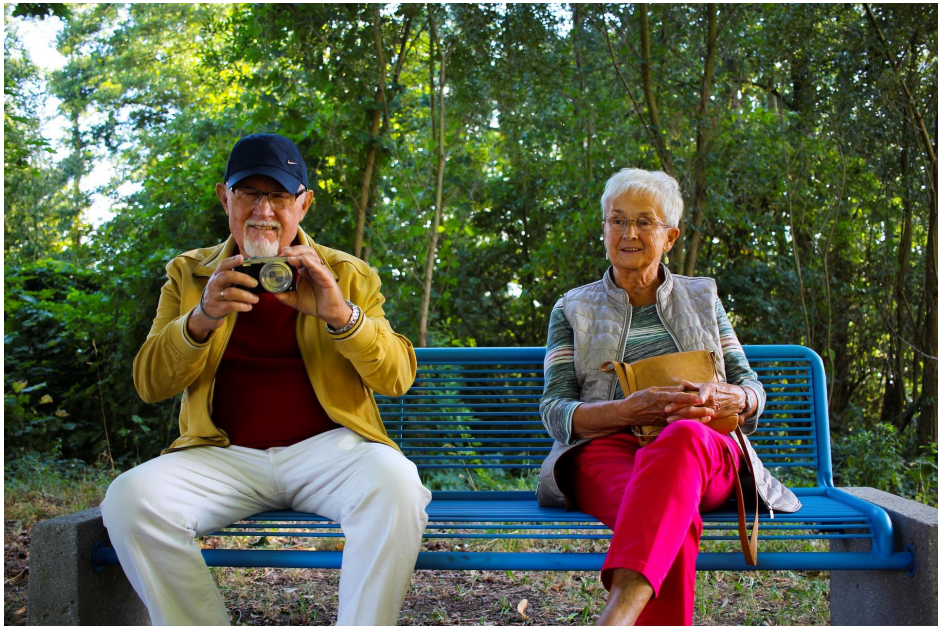
-ETSI TS 103 645: Cyber Security for Consumer IoT

-NIST IR 8228, 8259, 8267

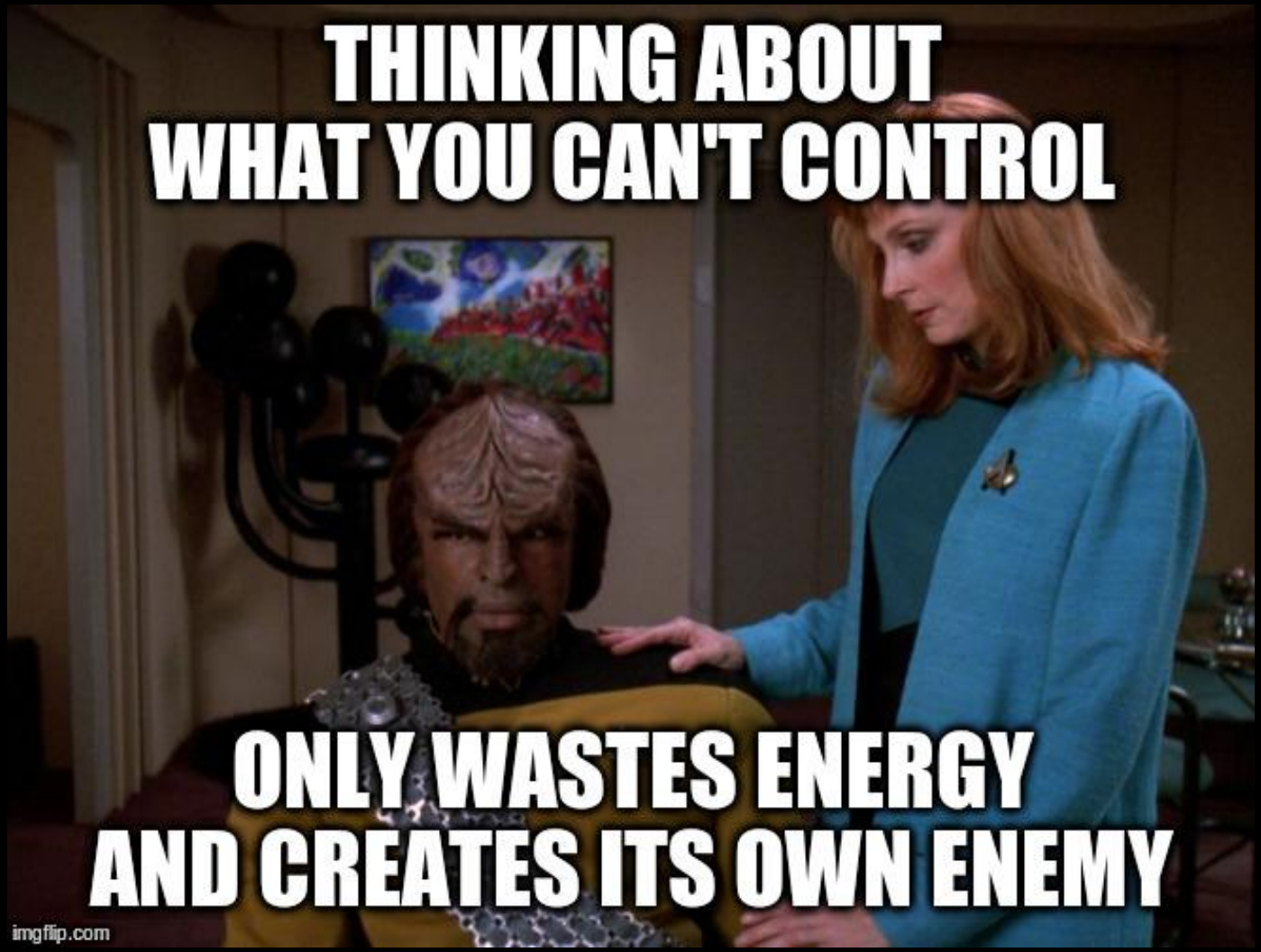
# Security - Can we sell it?

- ~ ⅓ some concern about “unauthorized access”
- > 50% default password
- < 50% look for security
- Setup time….

- Example: Norton Core - Secure Gateway



ESET & National Cyber Security Alliance (October 2019)


THINKING ABOUT
WHAT YOU CAN'T CONTROL
ONLY WASTES ENERGY
AND CREATES ITS OWN ENEMY
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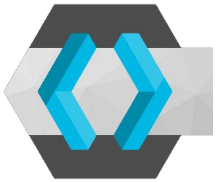
# Non-regulated improvements in web applications...











# Opportunities: Frameworks & IoT Application Stack

- **Cloud**
  - AWS, Azure, GCP, Bosch…
- **Software**
  - CoreOS, Ubuntu for IoT, Amazon FreeRTOS, BalenaOS, Windows 10 IoT Core…
- **Wireless Protocols**
  - BLE, Bluetooth, Zigbee, Sigfox, LTE, 5G...
- **Hardware**
  - … looking for ideas

Threat Model & Blog

Secure & Git
- Infrastructure as code
- Secure code snippets

Test & Report (or Patch)

# Opportunities: Secure Development in SDLC

**Design & Code (best):** Secure Frameworks, Secure Code Snippets, Linters
**Commit & Build (fine):** Code Review, SAST, SCA
**Integration & Test (usually, too late):** Fuzzing, DAST, Penetration Testing

> “There are a large number of duplicate binaries across multiple vendors, indicating a common build system or toolchain.”
>
> - Cyber ITL

IDE’s

- Platform IO
- Eclipse IoT (Kura)
- Node-Red

Build environments?...

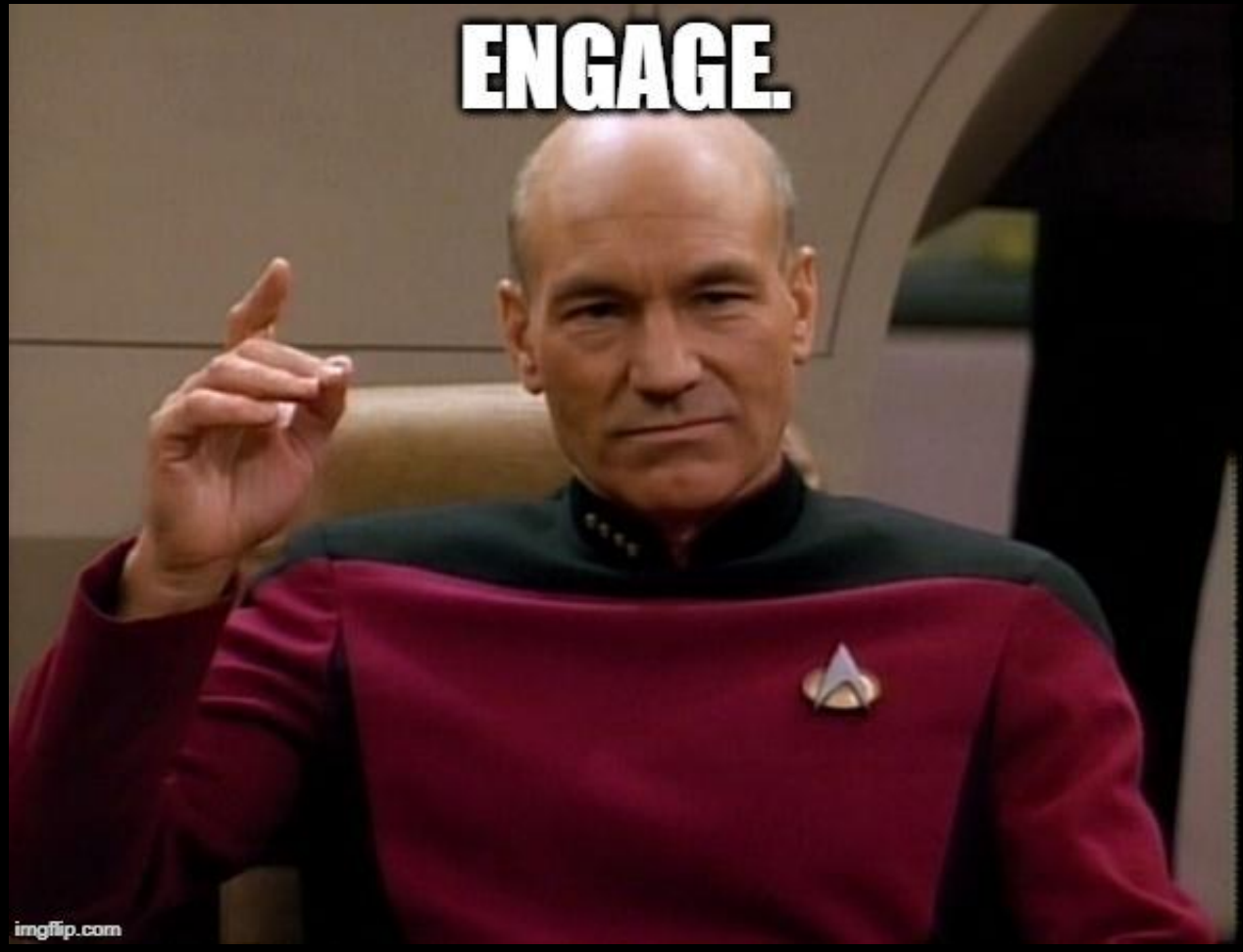
# Opportunities: Be the System Integrators


- YouTube→ SecureMeTube
- Consumer Security Review Site
  Ex. Internet of Shitdex
- Security Tools For Humans?
  Ex. Princeton IoT Inspector
- Authentication solution

# Opportunities: EU Research Funding


- https://ec.europa.eu/digital-single-market/en/newsroom-agenda/funding-opportunity/all/19/10/2019
- https://iot-epi.eu/
- https://www.eu-startups.com/startup-sourcing-research-service-for-investors-corporates/

# Opportunities: Ignore the Prime Directive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Princeton IoT Inspector https://iot-inspector.princeton.edu/
Cisco Survey Reveals Close to ¾ of IoT Projects are Failing
https://newsroom.cisco.com/press-release-content?articleId=1847422

# Media:

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Clker-Free-Vector-Images https://pixabay.com/de/vectors/ma%C3%9Fstab-gerechtigkeit-richter-40635/
On a similar vein... https://twitter.com/synackpse/status/1177667702095335424

# Memes:

ImgFlip MemeGenerator https://imgflip.com/memegenerator
Action Movie FX https://apps.apple.com/us/app/action-movie-fx/id489321253


Checking your vitals...

**Nathan Ruser**
@Nrg8000

Strava released their global heatmap. 13 trillion GPS points from their users (turning off data sharing is an option). medium.com/strava-enginee... ... It looks very pretty, but not amazing for Op-Sec. US Bases are clearly identifiable and mappable

19:24 · 27.01.18 · Twitter Web Client

”Shields up, Mr. LaForge!“

# OT: System Integrators


- Must implement according to asset owner requirements
- Integrators in security training

# OT: Product Supplier


- **The Good**
  - Technical Controls
    - MAC & IP Whitelisting
    - VPN
    - SSH & SFTP
    - HTTPS
  - Procedural controls
    - CERT

- **The Bad**
  - Unencrypted protocols
  - Updates limited
  - Aging devices in the field

# Opportunities: Vulnerability Management


- Don’t Panic Package:
  - ISO 29147: Vulnerability Disclosure
  - ISO 30111: Vulnerability Handling Processes

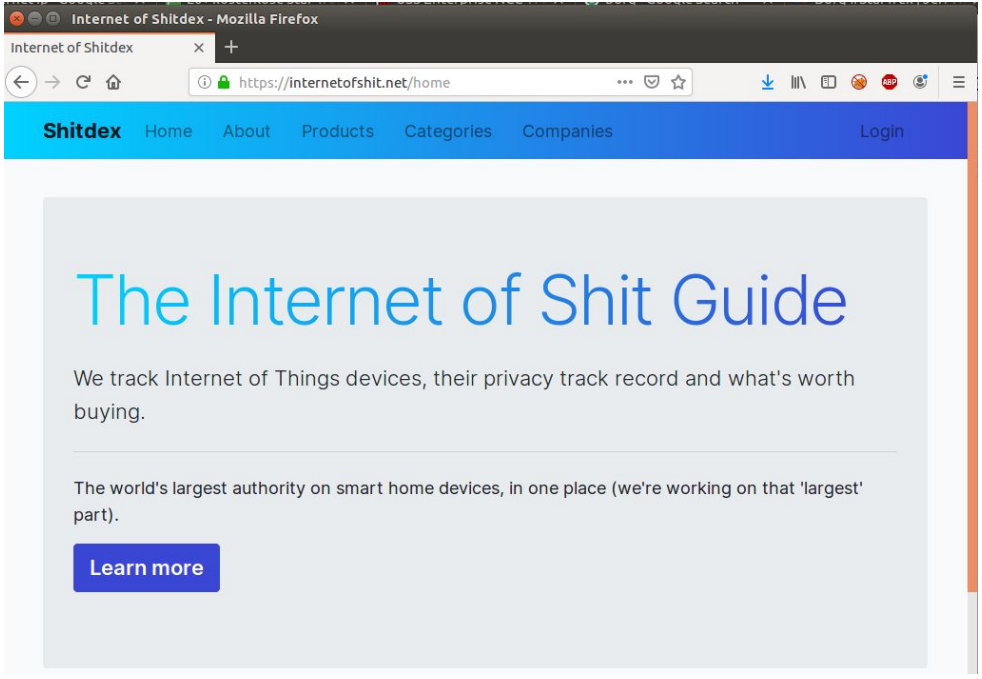
- Process for vendor that no longer exists?
  - 30% of IoT projects fail (Cisco, 2018)

# What about **consumer** IoT?

- **Legislation?**
  - Asset owners
  - Product suppliers
- **Standards?**

# Internet of “Shit”

Victor Petersson & Andrew Martin
The “S” in IoT Stands for Security (2018)



”Engage.”