Audit of an IoT system using Penetration testing

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Context

IoT development

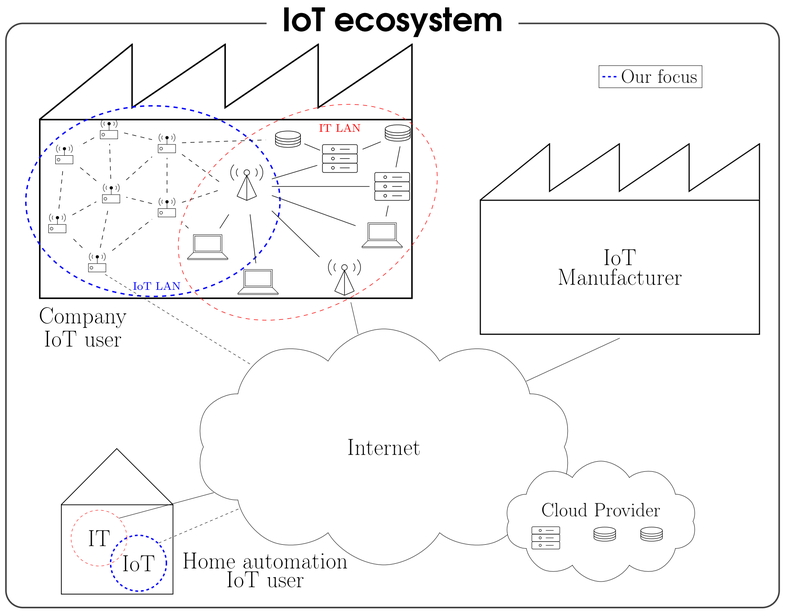
Fast growth

- Billions of devices expected
- Everything gets connected
- Market pressure

What about security ?

- Mirai botnet:
  - 148000 hacked devices
  - Used to block access to Twitter, Facebook
- Recall of 500 000 pacemakers
  - Produced by Abbott
  - Updated only by medical staff

IoT ecosystem



IoT security by penetration testing

Pentest ?

- A solution to evaluate security of complex systems (1)
- An authorized simulated attack

Pentest steps

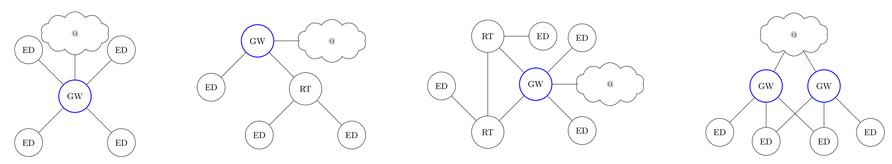
1. Information gathering
2. Threat Modelling
3. Vulnerabilities analysis
4. Exploitation
5. Post-exploitation
6. Reporting

Steps with IoT specificities

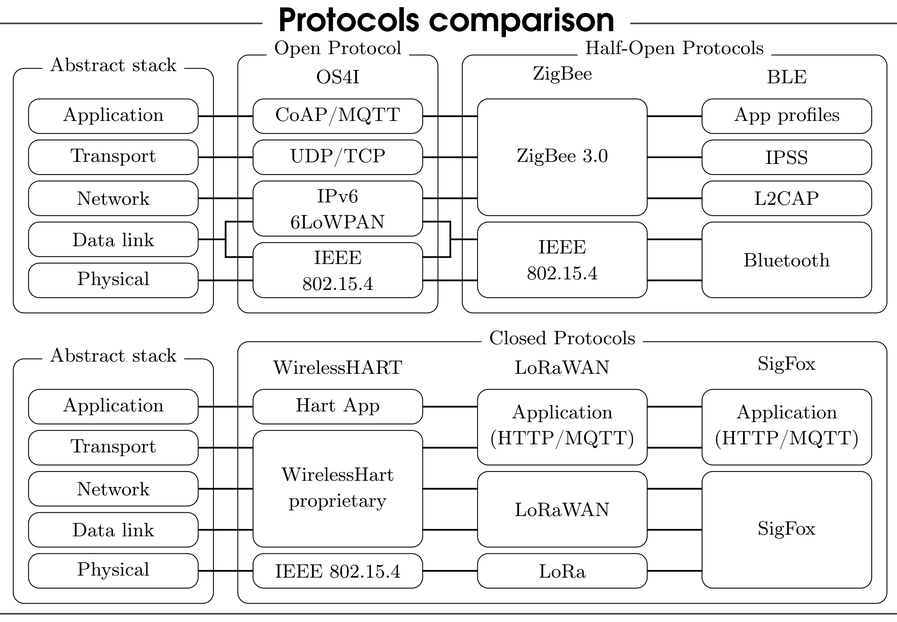
Information gathering

IoT protocols analysis

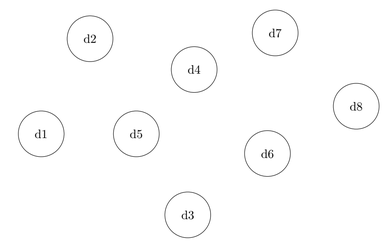
Topologies



Protocols comparison

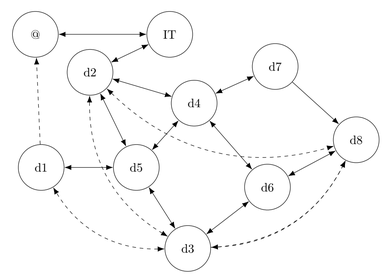


IoT Network modelling



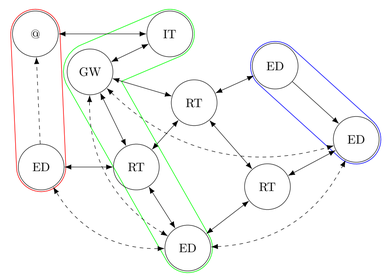
Step 1: network discovery

- Network coverage
- Devices discovery

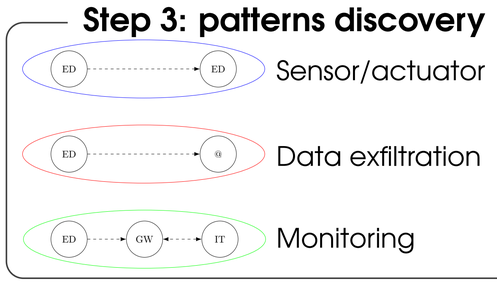


Step 2: devices connection

- Physical graph —
- Logical graph ----
- LiveNet (2), PMSW (6), IoTScanner (5), IoT Sentinel (3)



Step 3: patterns discovery



Vulnerabilities analysis

Attacks (4) against IoT networks based on the CIA principle

Protocols & messages

Passive attacks C

Traffic analysis based on the quality of encryption

Active attacks

- Cryptographic attacks CI
- MiTM CI

Topology

Alteration

- Sinkhole
- Flooding
- Sybil
- Spoofing

Attacks

- Blackhole A
- Selective forwarding A
- Eavesdropping C
- Injection I

References

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