(In)Security in the Internet of Things

Seminar Past and Future of Science

HTW SS 2014

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Agenda

- **Definition**
- **Provider**
- **Access**
- **IoT Devices**
- **Stakeholders**
- **Conclusion**

Definition

Definition

Provider

Access

IoT Devices

Stakeholders

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"The state of the art is perhaps analogous to the period when scribes had to know as much about making ink or baking clay as they did about writing." [C0]

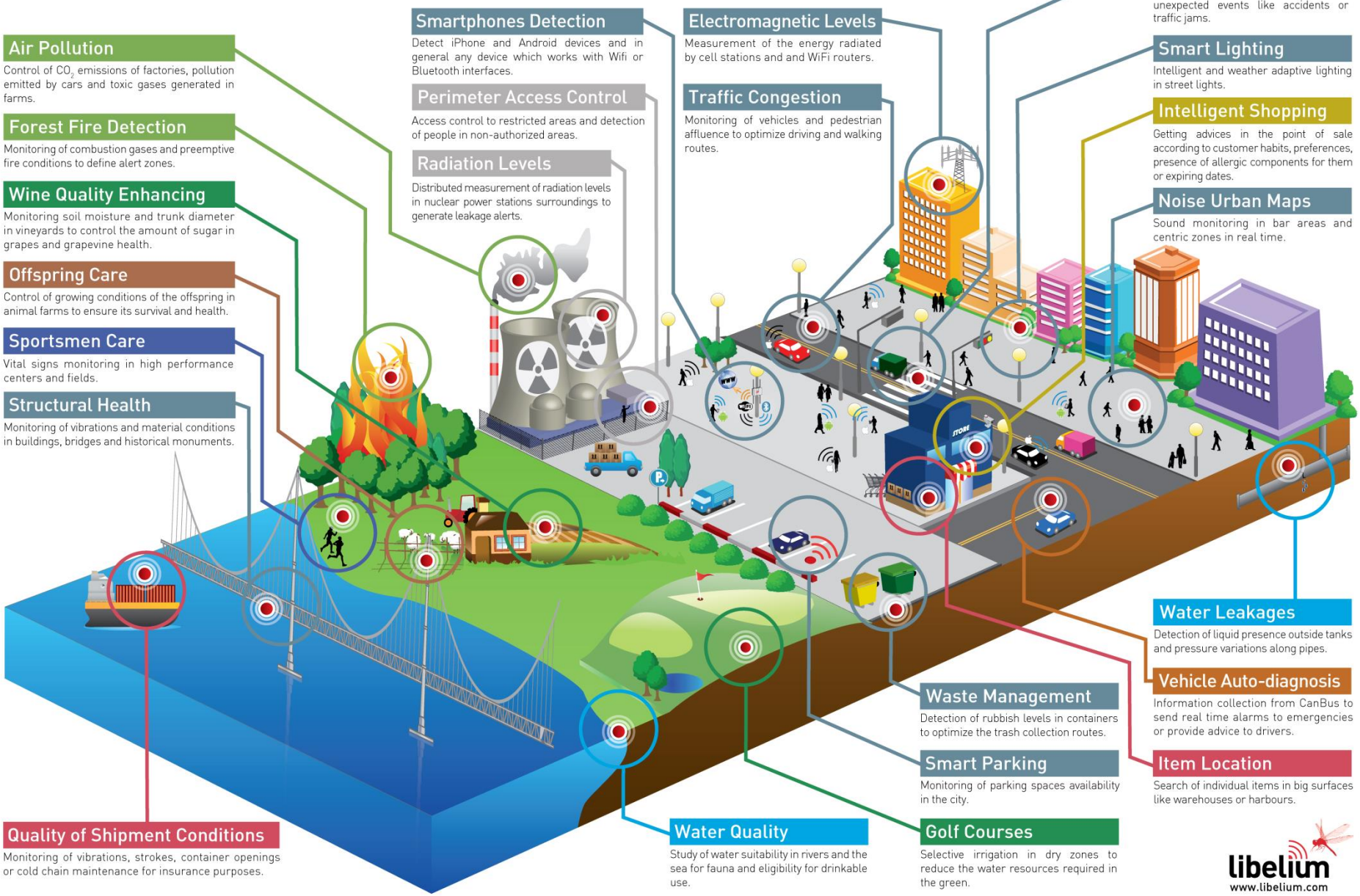
Mark Weiser, "The computer for the 21st century", 1991

"Internet of Things"

[C1]

Kevin Ashton, P&G, 1999

Libelium Smart World



Air Pollution
Control of CO_2 emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection
Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing
Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care
Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care
Vital signs monitoring in high performance centers and fields.

Structural Health
Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions
Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection
Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control
Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels
Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels
Measurement of the energy radiated by cell stations and and WiFi routers.

Traffic Congestion
Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Water Quality
Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Golf Courses
Selective irrigation in dry zones to reduce the water resources required in the green.

Waste Management
Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking
Monitoring of parking spaces availability in the city.

Smart Roads
Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting
Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping
Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps
Sound monitoring in bar areas and centric zones in real time.

Water Leakages
Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis
Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location
Search of individual items in big surfaces like warehouses or harbours.

libelium
www.libelium.com

Definition

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- **CIA Triad**
  - confidentiality: „Unauthorized information release [...]”
  - integrity: „Unauthorized information modification [...]”
  - availability: „Unauthorized denial of use [...]”

Jerome H. Saltzer and Michael D. Schroeder,
MIT, 1975 [C2]

Definition

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P2

Provider: mbed.org

- Definition
- **Provider**
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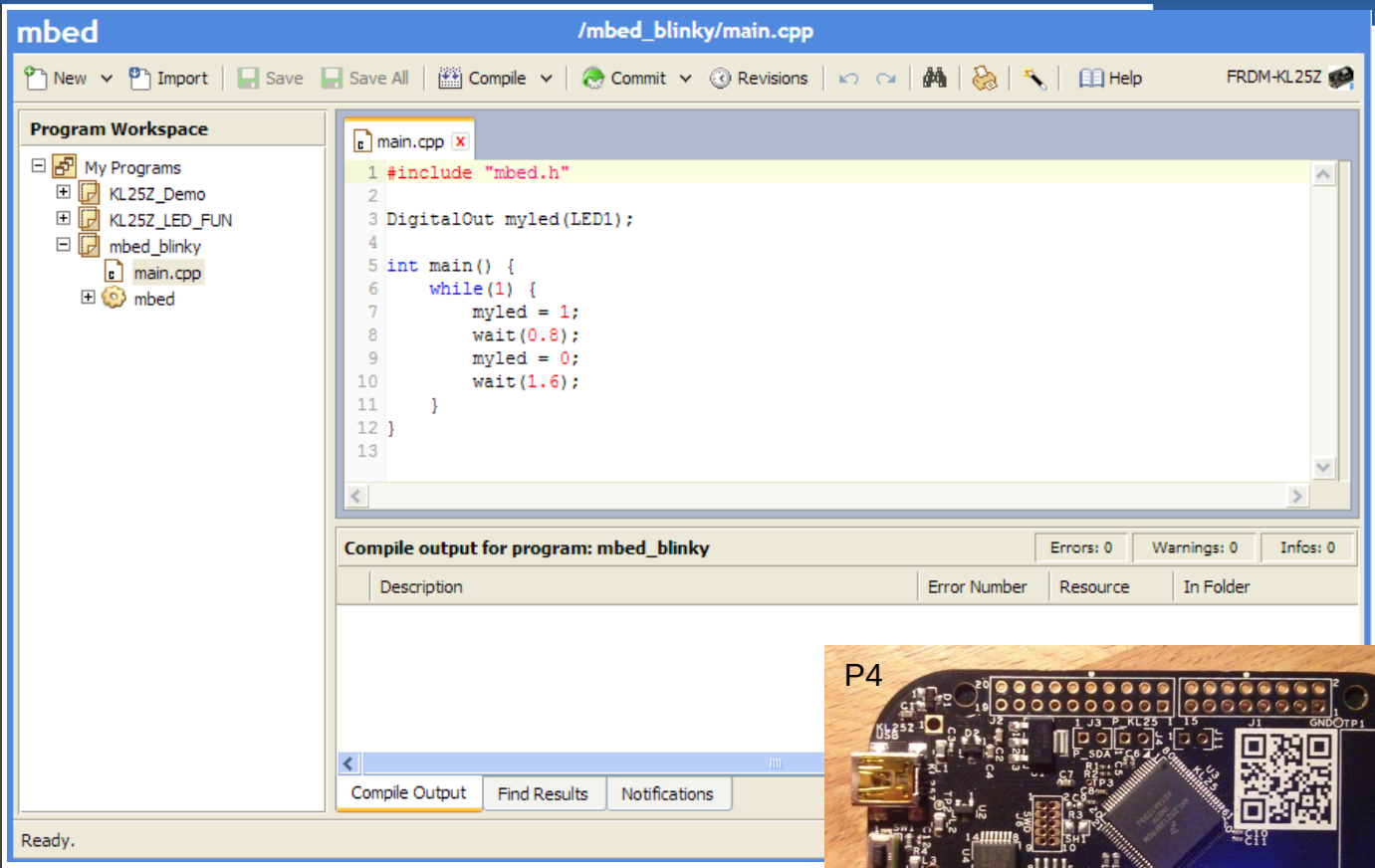
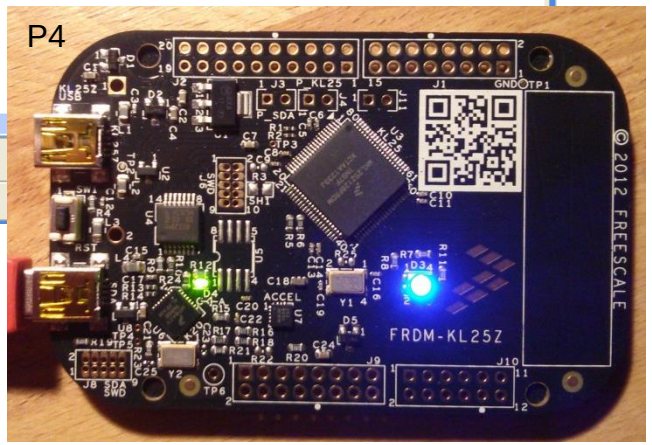
P3



C: IP, Heartbleed
I: Backdoors
A: Failover, RAID, Backups

P4



Provider: Xively

Definition

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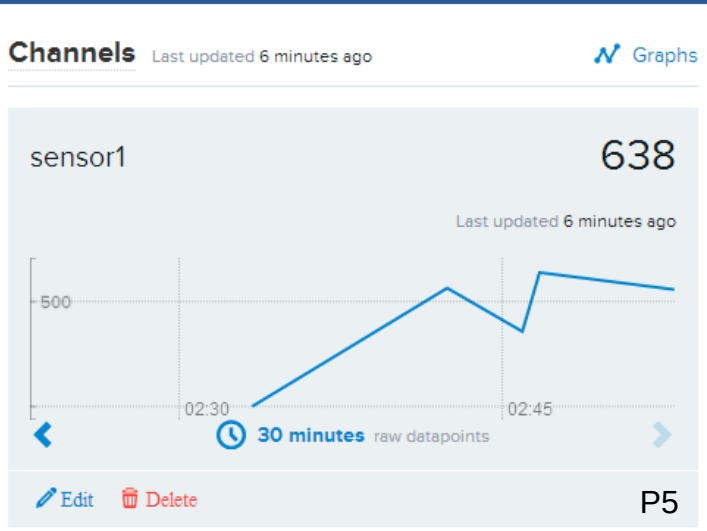
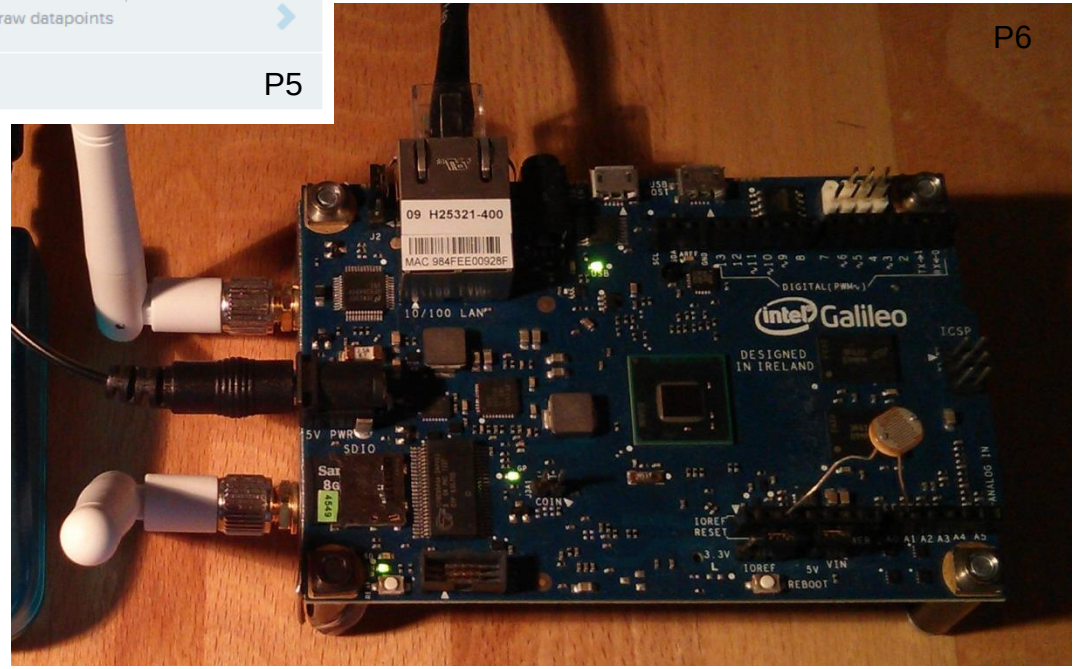


P5

C: Data Theft, Heartbleed
I: Data Manipulation
A: Failover, RAID, Backups



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Provider: Xively

Definition

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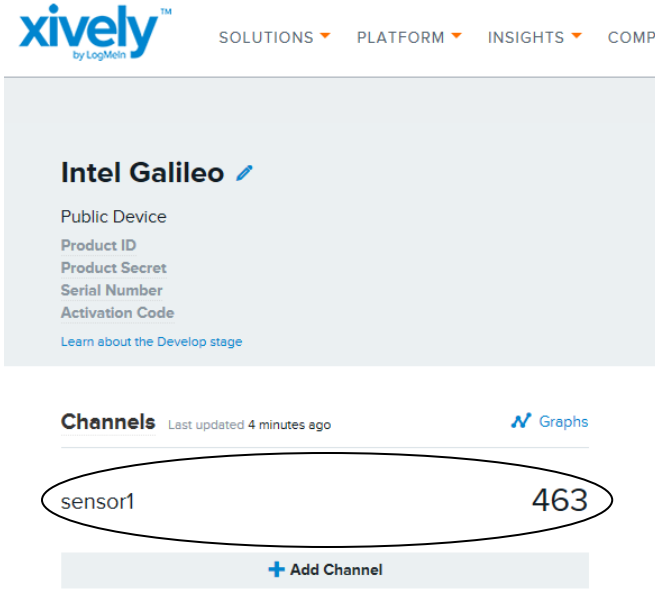

P7

```
PUT /v2/ feeds/63
8273836. csv HTTP
/1.1..Ho st: api.
pachube. com..X-P
achubeAp iKey: 12
7tXryXDP vEJRMjqg
73JaLNT3 mQnJTY9j
ZIE1GVIw KdOnto..
User-Age nt: Inte
l Galile o..Conte
nt-Lengt h: 11..C
ontent-T ype: tex
t/csv..C onnectio
n: close ....sens
or1,463. .
```

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Access

Definition

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C: UPnP, TR-069
I: Linux, Firmware Autoupgrades
A: TCP(32764), UPnP (..again)

P9

Linksys WAG200G

IoT Devices

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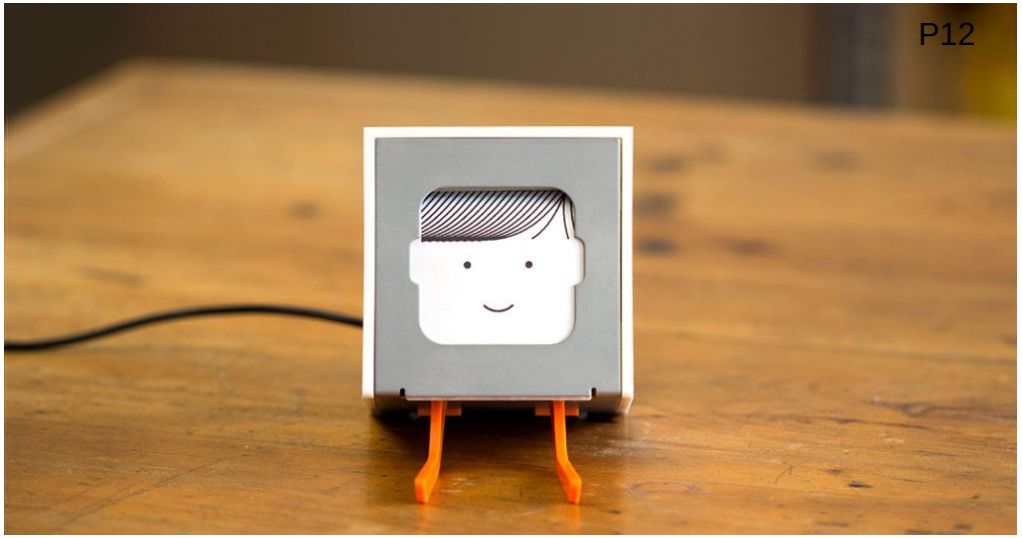
P11



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IoT Devices

Definition

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C: „CiscoGate“, Physical Security
I: E-Lock, Elliptic Curves
A: Firmware Upgrades?!

elektor E-Lock P13

Stakeholders

Definition

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Conclusion

- **IoT developing Corporations**
- **IoT using Corporations**
- **Governments**
- **Citizens**
- **Criminals**

Stakeholders (Amphion Forum Sponsors)

Stakeholders (Military Contractors)

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Conclusion

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“We have to put pressure on embedded system vendors to design their systems better.” [C3]

Bruce Schneier, 2014

Questions?

Thank you very much for your attention!

Bibliography - Documents

- C0 - http://doi.acm.org/10.1145/329124.329126
- C1 - http://www.rfidjournal.com/articles/view?4986
- C2 – DOI: 10.1109/PROC.1975.9939
- C3 - https://www.schneier.com/essays/archives/2014/01/the_internet_of_thin.html

Bibliography - Media

- P0 - http://www.forbes.com/sites/jacobmorgan/2014/05/13/simple-explanation-internet-things-that-anyone-can-understand/
- P1 - http://www.libelium.com/top_50_iot_sensor_applications_ranking#show_infographic
- P2 – Own graphic
- P3 – Screenshot of www.mbed.org IDE
- P4 – Own Photo of Intel Galileo Platform
- P5 – Screenshot of www.xively.com Dev System
- P6 – Own Photo of Intel Galileo Platform
- P7 – Screenshot of www.xively.com Dev System

Bibliography - Media

- P8 – Own graphic, Wireshark Capture of xively.com communication
- P9 - Linksys WAG200G, http://securityaffairs.co/wordpress/20941/hacking/netgear-linkys-routers-backdoor.html
- P10 – Safecast, http://blog.safecast.org/
- P11 – Google Nest, http://tech.co/google-makes-big-announcement-nest-2014-01
- P12 –Little Printer, http://littleprinter.com/
- P13 – elektor E-Lock, http://www.elektor.com/e-lock
- P14 – Amphion Forum Sponsors, https://amphionforum.com
- P15 –BoT, http://www.technewsdaily.com/images/i/000/006/937/original/military-big-data-02.jpg