

IoT challenges

State of the art

Aghiles DJOUDI

Paris-Est University

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Outline

1. Introduction

2. State of the art

3. Conclusion

Context

Introduction

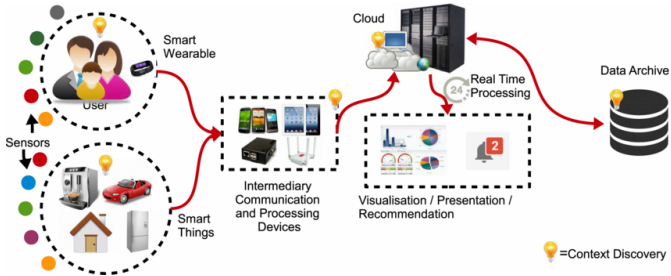


Figure 1: The IoT Platform

- ➡ Connect sensors to the gateway.
- ➡ Connect the gateway to the infrastructure.
- ➡ Store & Analyze sensors data.

Problematic

Introduction



Figure 2: The IoT problematics

- ➡ How to communicate sensors efficiently
 - ➡ IEEE 802.15.4, 6LowPAN
 - ➡ Throughput, Delay, Jitter, Loss rate and Availability.
- ➡ How to communicate sensors with the infrastructure efficiently
 - ➡ LPWAN, LoraWan
 - ➡ Heterogeneity ?
- ➡ How to extract knowledge from sensors data.
 - ➡ Data mining: Classification, Clustering
 - ➡ Deep learning: Machine learning

Problematic

Introduction



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- 1. Heterogeneity
- 2. Security

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1. Heterogeneity

2. Security

Literature review

Related work

- [1] Many studies have identified **SDN** as a potential solution to the WSN challenges, as well as a model for **heterogeneous** integration.
- [1] This **shortfall** can be resolved by using the **SDN approach**.
- [2] **SDN** also enhances better control of **heterogeneous** network infrastructures.
- [2] Anadiotis et al. define a **SDN operating system for IoT** that integrates SDN based WSN (**SDN-WISE**). This experiment shows how **heterogeneity** between different kinds of SDN networks can be achieved.
- [2] In cellular networks, OpenRoads presents an approach of introducing **SDN** based **heterogeneity** in wireless networks for operators.
- [3] There has been a plethora of (industrial) studies **synergising SDN in IoT**. The major characteristics of IoT are low latency, wireless access, mobility and **heterogeneity**.
- [3] Thus a bottom-up approach application of **SDN** to the realisation of **heterogeneous IoT** is suggested.
- [3] Perhaps a more complete IoT architecture is proposed, where the authors apply **SDN** principles in IoT **heterogeneous** networks.
- [4] it provides the **SDWSN** with a proper model of network management, especially considering the potential of **heterogeneity** in SDWSN.
- [4] We conjecture that the **SDN paradigm** is a good candidate to solve the **heterogeneity** in IoT.

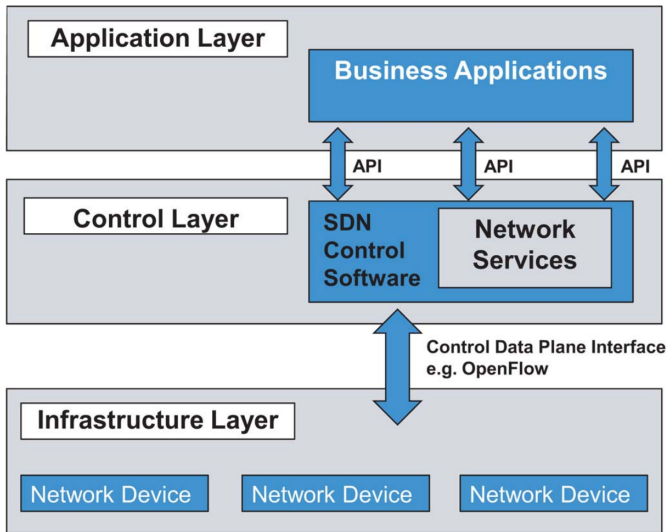


Figure 3: Architecture and technology abstraction.

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2. Security

Security in SDN

related work

| WSN OSI Layer | SDN Plane | Threat |
|---------------|-------------|--|
| Application | Application | Poor Authentication and Control |
| | | Fraudulent flows rules insertion |
| | | Poor access control and accountability |
| | | Malicious Application |
| | | DoS |
| | | Northbound Interface (API) attack |
| Transport | Control | Threats from applications |
| | | DoS |
| Network | | Unauthorised access |
| | | Scalability & Unavailability |
| | | Faulty or Malicious controller |
| Data Link | Data | Unauthorised access |
| | | Fraudulent rules |
| | | Forged/False traffic flows |
| | | Flooding, Spoofing |
| Physical | | Southbound Interface (API) attack |
| | | Jamming, Tampering |
| | | Sybil |
| | | Compromised/hi-jacked controller |
| | | Malicious node |

Table: SDN vs OSI layer

SDN based sensor network

| Management architecture | Management feature | Controller configuration | Traffic Control | Configuration and monitoring | Scapability and localization | Communication management |
|-------------------------|--|--------------------------|-----------------|------------------------------|------------------------------|--------------------------|
| [5] Sensor Open Flow | SDN support protocol | Distributed | in/out-band | ✓ | ✓ | ✓ |
| [6] SDWN | Duty sycling, aggregation, routing | Centralized | in-band | ✓ | | |
| [7] SDN-WISE | Programming simplicity and aggregation | Distributed | in-band | | ✓ | |
| degante_smart_2014a | Efficiency in resource allocation | Distributed | in-band | | ✓ | |
| SDCSN | Network reliability and QoS | Distributed | in-band | | ✓ | |
| TinySDN | In-band-traffic control | Distributed | in-band | | ✓ | |
| Virtual Overlay | Network flexibility | Distributed | in-band | | ✓ | |
| Context based | Network scalability and performance | Distributed | in-band | | ✓ | |
| CRLB | Node localization | Centralized | in-band | | | |
| Multi-hope | Traffic and energy control | Centralized | in-band | | | ✓ |
| Tiny-SDN | Network task measurement | - | in-band | | | |

Table 1: SDN-based network and topology management architectures. [3]

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Conclusion

- ➡ Heterogeneity is a big challenge in IoT environment, like mobility, scalability, QoS and security.
- ➡ I propose to use SDN (SDN-WISE) to manage heterogeneity.
- ➡

Conclusion

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- ➡ I propose to use SDN (SDN-WISE) to manage heterogeneity.
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Thank you !

References

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