# IoT challenges

State of the art

Aghiles DJOUDI

LIGM/ESIEE Paris

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- 2. State of the ar
- 3. Conclusion
- 4. State of the art
- 5 First contribution
- Second contribution
- 7. Conclusion

1. \*Context

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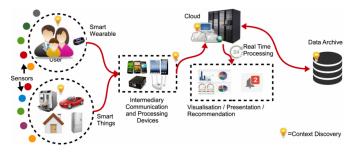


Figure 1: The IoT Platform

- [1] Connect sensors to the gateway[1].
- Connect the gateway to the infrastructure.
- Store & Analyze sensors data[2].

[1] Musa Ndiaye, Gerhard Hancke, and Adnan Abu-Mahfouz. Software Defined Networking for Improved Wireless Sensor Network Management: A Survey In: 17.5 (May 4, 2017). 00053, p. 1031.
[2] Pascall Thubert, Maria Riba Palatella, and Thomas Engel. STECH Centralized Scheduling: When SDN Meet lot In: 2016 IEEE Conference on Standards for Communications and Networking (CSCN).
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#### **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

1. Introduction | 3. Problematic 2/32

#### **Problematic**

Introduction



Figure 2: The IoT problematics

- How to communicate sensors efficiently
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  - Throughput, Delay, Jitter, Loss rate and Availability.
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  - Data mining: Classification, Clustering
  - Deep learning: Machine learning

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#### Motivations

Introduction

- First Motivation
  - First Motivation
    - \* First Motivation
    - \* Second Motivation
  - Second Motivation
- Second Motivation
- First Motivation
  - Second Motivation
- Third Motivation
  - → First Motivation
  - Second Motivation
- Fourth Motivation
  - First Motivation
  - Second Motivation

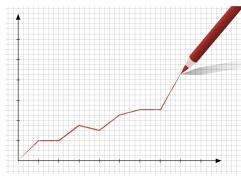


Figure 3

# Goals

- First goal
  - → First goal
    - First goal
    - \* Second goal
  - Second goal
- Second goal
  - First goal
  - Second goal
- Third goal
  - First goal
  - Second goal
- Fourth goal
  - → First goal
  - Second goal

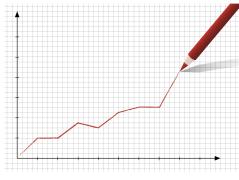


Figure 4

1. Introduction | 5. Goals 4/32

## Challenges

#### Introduction

- First Challenge
  - → L'objectif est de réduire le taux de mortalité
  - → L'objectif est de rendre nos route plus sure
- Second Challenge
  - Connecter les pietons et le vehicule
  - augmenter la présision GPS
  - réduire la latence
- Third Challenge
  - → Connecter les pietons et le vehicule
  - → augmenter la présision GPS
  - → réduire la latence

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#### Contributions

Introduction

- First contribution
  - Privacy settings
  - → Information propagation

- Second contribution
  - → Privacy settings
  - \_
- Third contribution
  - Privacy settings
  - **→** [

- Introduction
- 2. State of the art
- 3. Conclusion
- 4. State of the art

1. \*Context

- 5. First contribution
- 6. Second contribution
- 7. Conclusion

- 1. Introduction
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- 3. Conclusion
- 4. State of the ar
- 5. First contribution
- 6. Second contribution
- Conclusion

- 2. Application protocols
- 3. Service discovery
- 4. Network layer
- 5. Link & Physical layer

## State of the art

Standardization

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- 1. Introduction
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- 3. Conclusion
- 4. State of the ar
- First contribution
- 6. Second contribution
- Conclusion

#### 2. Application protocols

- Service discovery
- Network layer
- 5. Link & Physical layer

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- 7. Conclusio

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- 6. Second contribution
- 7 Conclusion

## Conclusion

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- Introduction
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- 3. Conclusion
- 4. State of the art
- 5. First contribution
- 6. Second contribution
- 7 Conclusion

## State of the art

Standardization

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Conclusion

4. State of the art 10/32

- Introduction
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- 3. Conclusion
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- 5. First contribution
- 6. Second contribution
- Conclusion

- 1. Related work
- 2. Contagion process
- 3. Experimentation
- 4. Results exploitation
- 5. Conclusion

- Introduction
- 2. State of the ar
- 3. Conclusion
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- 6 Cooped contribution
- Conclusion

#### 1. Related work

- 2. Contagion process
- Experimentation
- 4. Results exploitation
- 5. Conclusion

#### Related work

Comparison

Paper	A1	A2	A3	A4

Table 1: An example table.

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#### Related work

Comparison

Paper	A1	A2	A3	A4

Table 2: An example table.

- Introduction
- 2. State of the ar
- Conclusion
- 4. State of the art
- 5. First contribution
- 6 Second contribution
- o. occoria contribution
- Conclusion

- Related work
- 2. Contagion process
- Experimentation
- Results exploitation
- Conclusion

```
... (step 1)
Methods
```

- Privacy threats
  - Privacy settings
  - → Information propagation
  - .
- Privacy protection
  - Privacy settings
  - -

# ... (step 2) Methods

- Privacy threats
  - Privacy settings
  - → Information propagation
- Privacy protection
  - Privacy settings
  - -

```
... (step 3)
Methods
```

- Privacy threats
  - → Privacy settings
  - → Information propagation
  - .
- Privacy protection
  - Privacy settings
  - -

```
... (step 4)
Methods
```

- Privacy threats
  - Privacy settings
  - → Information propagation
- Privacy protection
  - Privacy settings
  - -

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- Results exploitation
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## Experimentation

Experimentation

- Privacy threats
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- Privacy protection
  - → Privacy settings
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- Related work
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- 5 Conclusion

# Results

Comparison

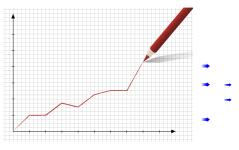


Figure 5

- Introduction
- 2. State of the ar
- Conclusion
- 4. State of the art
- 5. First contribution
- 6 Second contribution

- Related work
- 2. Contagion process
- Experimentation
- 4. Results exploitation
- 5. Conclusion



Figure 6: Cag.



Figure 7: Cag.



Figure 8: Cag.



Figure 9: Cag.

# Challenges

- Privacy threats
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  - → Information propagation
  - .
- Privacy protection
  - Privacy settings
  - -

- Introduction
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- 3. Conclusion
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- Introduction
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- 6. Second contribution
- Conclusion

- 1. Related work
- Contagion process
- Experimentation
- Results exploitation
- 5. Conclusion

#### Related work

Comparison

A1	A2	A3	A4
	A1	A1 A2	A1 A2 A3

Table 3: An example table.

#### Related work

Comparison

Paper	A1	A2	A3	A4

Table 4: An example table.

- Introduction
- 2. State of the ar
- 3. Conclusion
- 4. State of the ar
- 5 First contribution
- 6. Second contribution
- 7. Conclusion

- Related work
- 2. Contagion process
- 3. Experimentation
- Results exploitation
- 5. Conclusion

- Privacy threats
  - Privacy settings
  - → Information propagation
  - .
- Privacy protection
  - Privacy settings
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# ... (step 2) Methods

- Privacy threats
  - Privacy settings
  - → Information propagation
- Privacy protection
  - Privacy settings
  - -

- Privacy threats
  - Privacy settings
  - → Information propagation
- Privacy protection
  - Privacy settings
  - -

```
... (step 4)
Methods
```

- Privacy threats
  - Privacy settings
  - → Information propagation
- Privacy protection
  - Privacy settings
  - -

- Introduction
- 2. State of the ar
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- 6. Second contribution
- 7. Conclusion

- 1. Related work
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## Experimentation

Experimentation

- Privacy threats
  - Privacy settings
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- Privacy protection
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## Results

Comparison

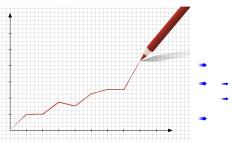


Figure 10

- Introduction
- 2. State of the ar
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- 5 First contribution
- 6. Second contribution
- 7. Conclusion

- 1. Related work
- Contagion process
- Experimentation
- 4. Results exploitation
- 5. Conclusion



Figure 11: Cag.



Figure 12: Cag.



Figure 13: Cag.



Figure 14: Cag.

# Challenges

- Privacy threats
  - Privacy settings
  - → Information propagation
  - .
- Privacy protection
  - → Privacy settings
  - -

- Introduction
- 2. State of the ar
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- First contribution
- 6. Second contribution
- 7. Conclusion

Routing protocol	Control Cost	Link Cost	Node Cost
OSPF/IS-IS	Х	✓	X
OLSRv2	?	1	1
RIP	<b>✓</b>	?	X
DSR	<b>✓</b>	X	X
RPL	1	1	1

Table 5: Routing protocols comparison [\_rpl2\_]

Application protocol	Rest- Full	Trans- port	Pub- lish/Sub- scribe	Request/Re- sponse	Secu- rity	QoS	Header size (Byte)
COAP	<b>√</b>	UDP	<b>✓</b>	<b>✓</b>	DTLS	<b>✓</b>	4
MQTT	X	TCP	<b>✓</b>	X	SSL	✓	2
MQTT-SN	X	TCP	<b>✓</b>	X	SSL	✓	2
XMPP	X	TCP	<b>✓</b>	<b>✓</b>	SSL	X	-
AMQP	X	TCP	<b>✓</b>	X	SSL	✓	8
DDS	Х	UDP	✓	X	SSL	1	-
		TCP			DTLS		
HTTP	✓	TCP	X	<b>✓</b>	SSL	Х	-

Table 6: Application protocols comparison

#### Conclusion

Routing protocol	Control Cost	Link Cost	Node Cost
OSPF/IS-IS	Х	✓	X
OLSRv2	?	<b>✓</b>	<b>✓</b>
RIP	<b>✓</b>	?	X
DSR	<b>✓</b>	X	X
RPL	✓	1	<b>✓</b>

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COAP	✓	UDP	✓	<b>✓</b>	DTLS	✓	4
MQTT	Х	TCP	✓	X	SSL	<b>✓</b>	2
MQTT-SN	Х	TCP	✓	X	SSL	<b>✓</b>	2
XMPP	Х	TCP	✓	✓	SSL	X	-
AMQP	Х	TCP	✓	X	SSL	<b>✓</b>	8
DDS	Х	UDP	✓	X	SSL	1	-
		TCP			DTLS		
HTTP	<b>✓</b>	TCP	X	<b>✓</b>	SSL	X	-

Table 6: Application protocols comparison

# Thank you!

# Challenges

Conclusion

- Privacy threats
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  - → Information propagation

- Privacy protection
  - → Privacy settings
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# Challenges Conclusion

- Privacy threats
  - Privacy settings
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# Thank you!

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#### References

- [1] Musa Ndiaye, Gerhard Hancke, and Adnan Abu-Mahfouz. \*\* Software Defined Networking for Improved Wireless Sensor Network Management: A Survey \*\*. In: 17.5 (May 4, 2017). 00053, p. 1031 (p. 4).
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