



# Confident-based Adaptable Connected objects discovery to HArmonize smart City Applications

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# Summary

- Background and Motivation
- CACHACA - let's discover
- Performance Evaluation

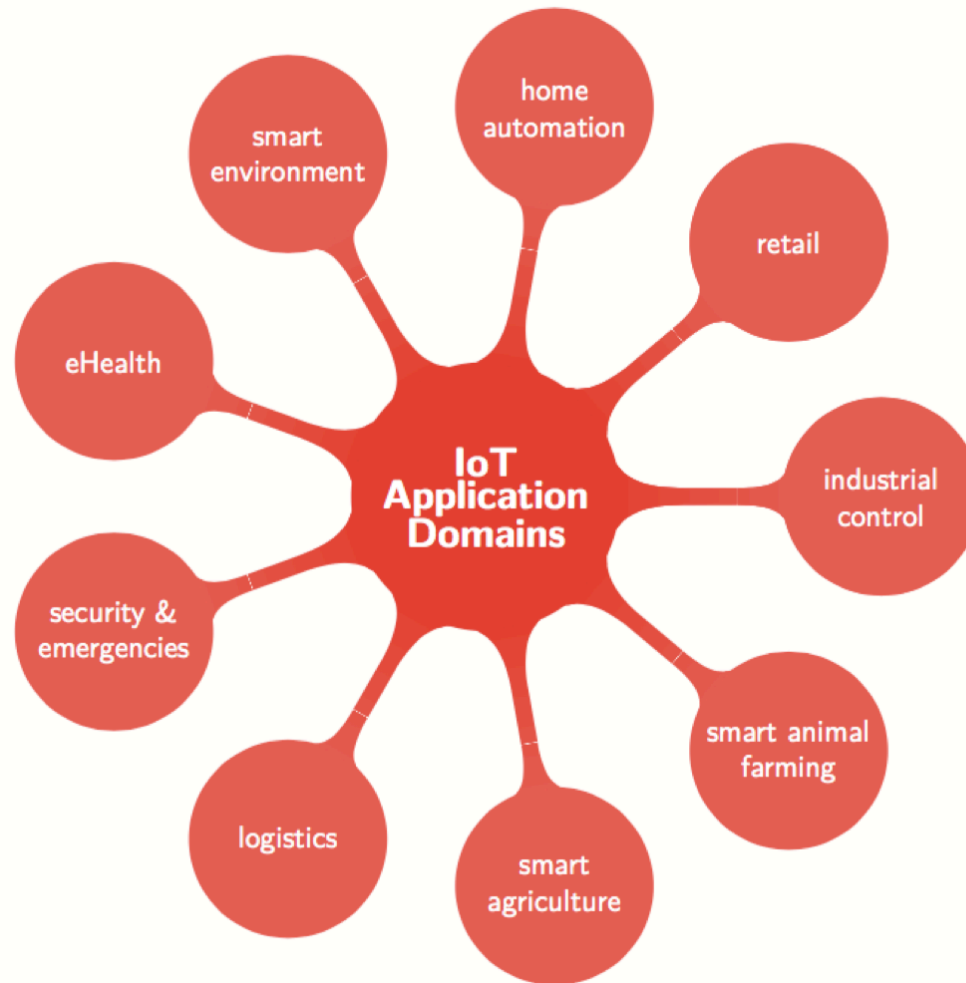
# 1. Background and motivations

## The Internet of Things

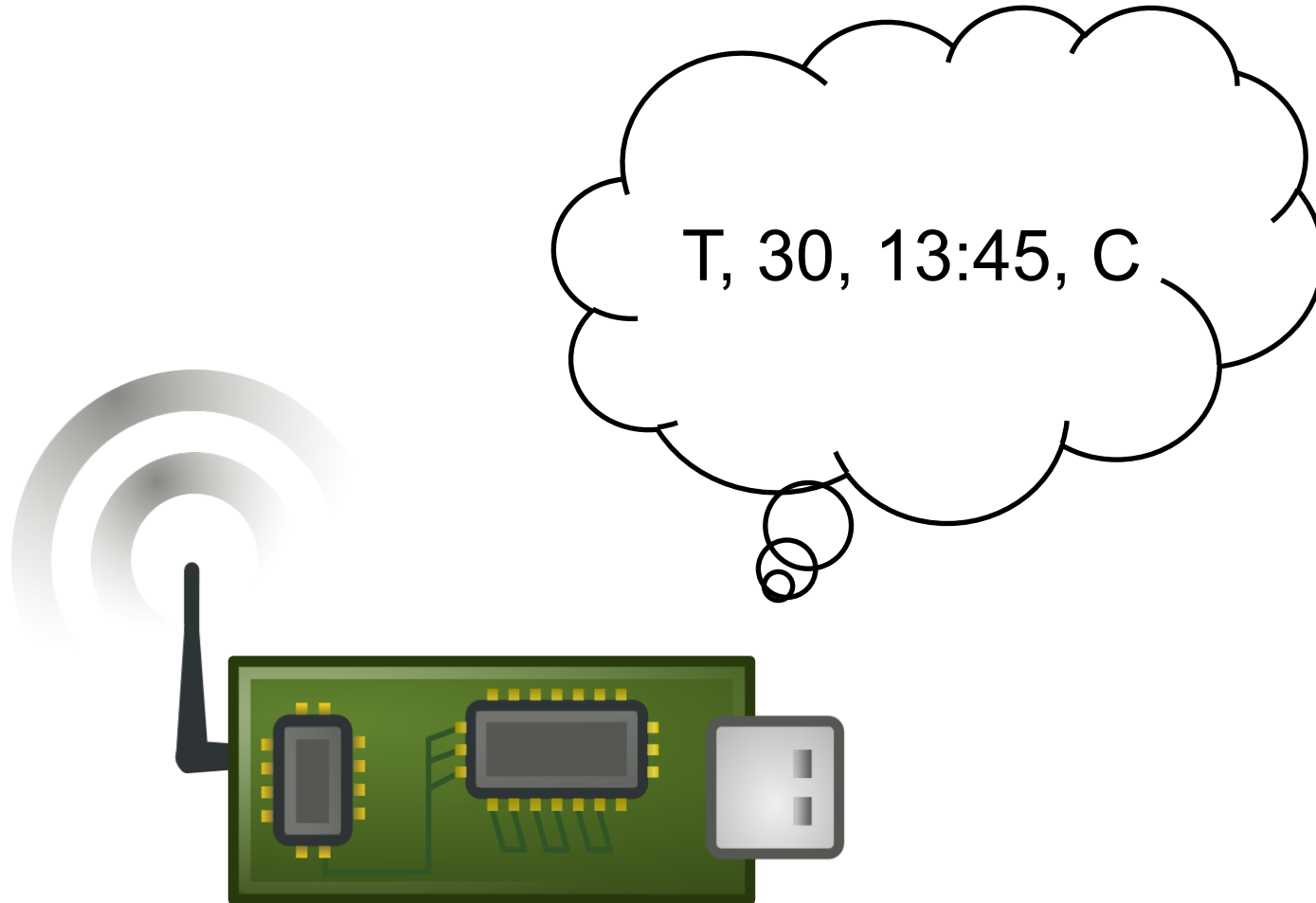
# The Internet of Things, **connectivity** for anything

“from *anytime* and *anyplace*, *anyone* will now have  
connectivity for *anything*”

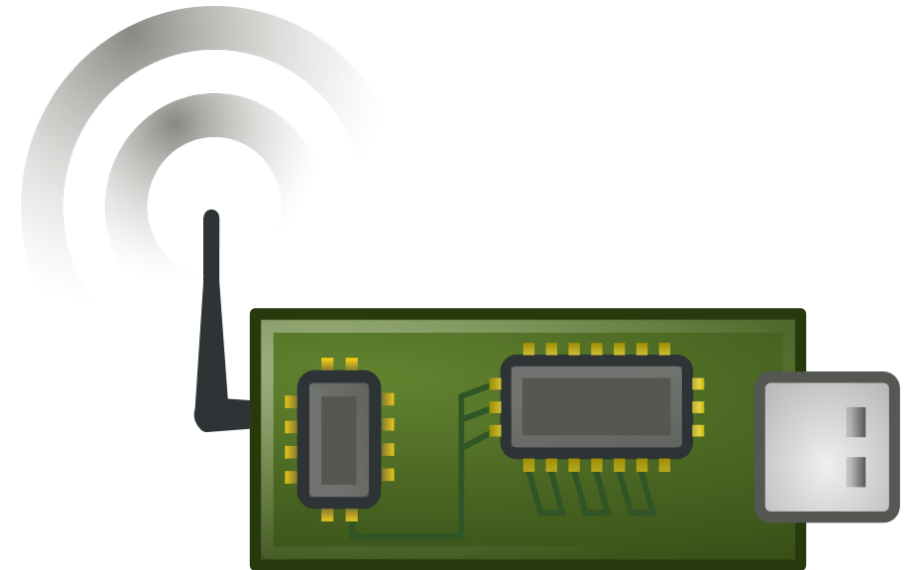
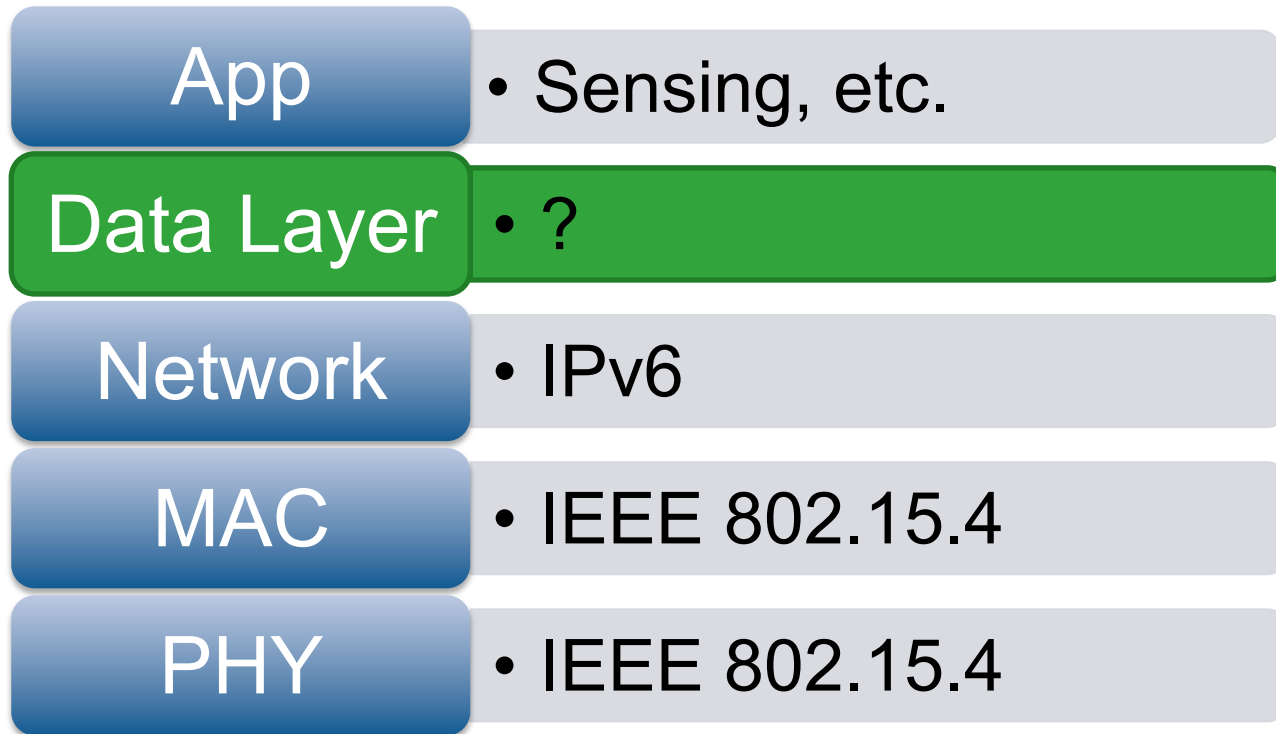
# The IoT will change all the aspects in our lives



How to understand data which comes out and goes into the “*things*”?

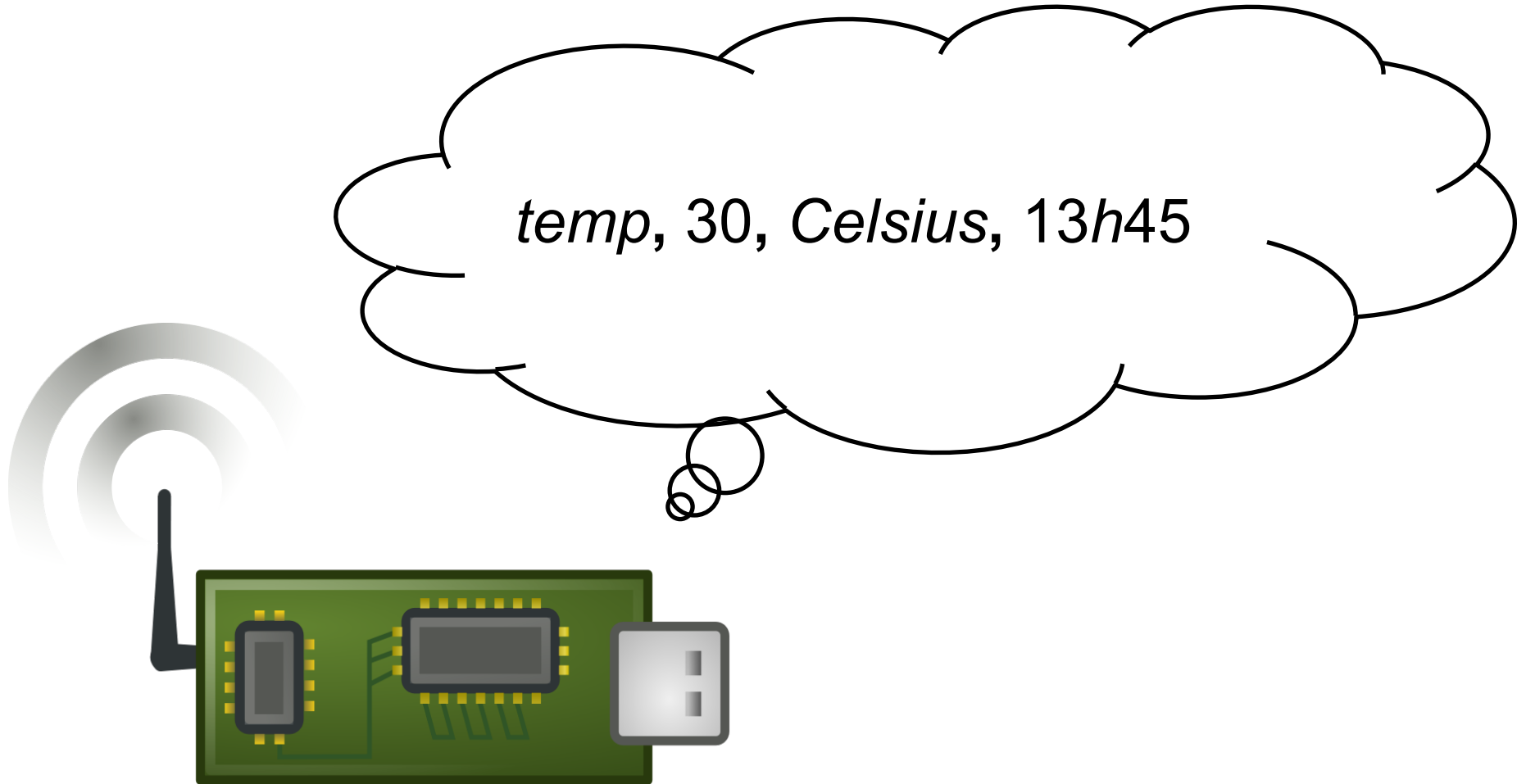


# How to understand data which comes out and goes into the “things”?



Building the “data layer”:  
we use the IPSO Alliance data types

*temp, 30, Celsius, 13h45*





# First takeaways

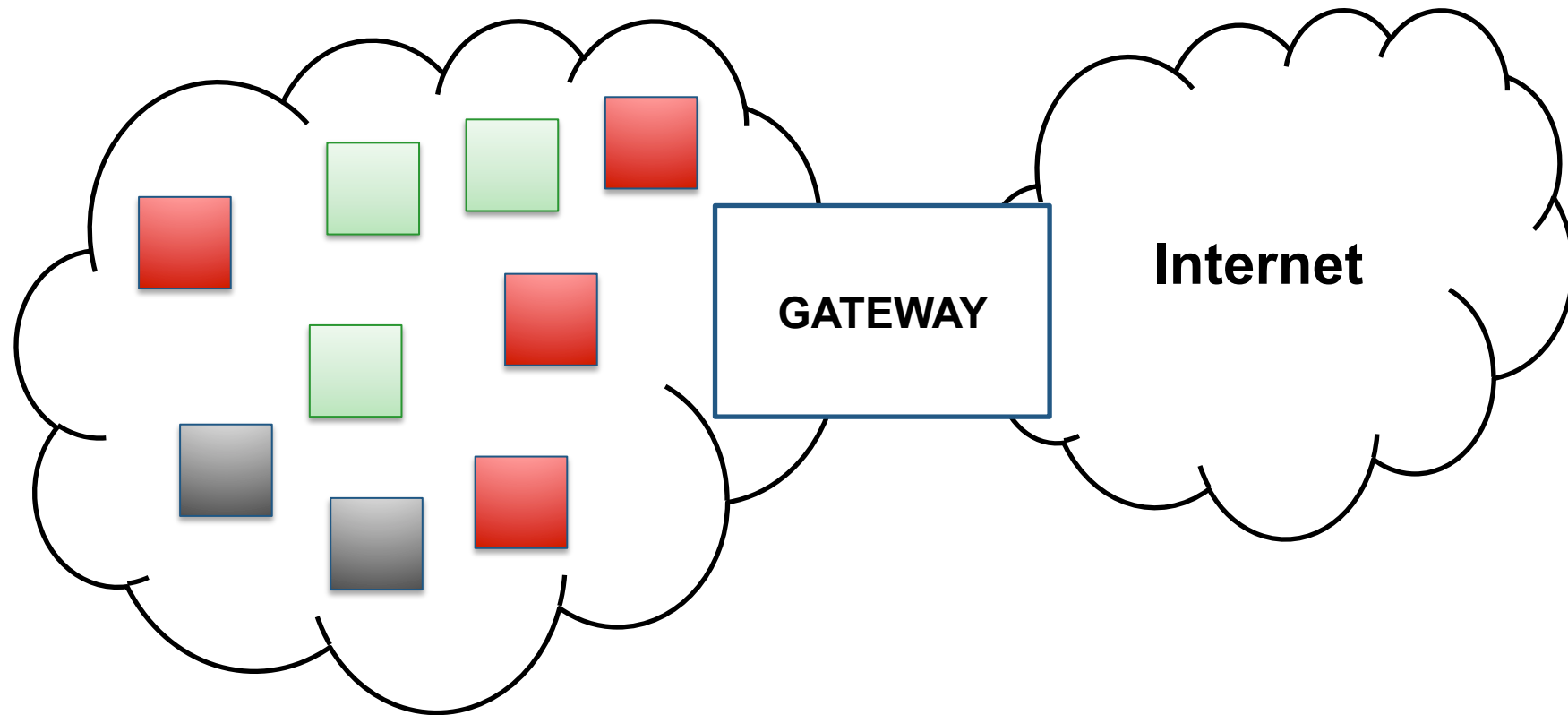
- The IoT opens many research opportunities
- The “data layer” introduces many benefits
- **Challenge:** discovery of resources and services



## 2. CACHACA – let's discover

Confident-based Adaptable Connected objects  
discovery to HArmonize smart City Applications

# CACHACA runs on Sensor Networks

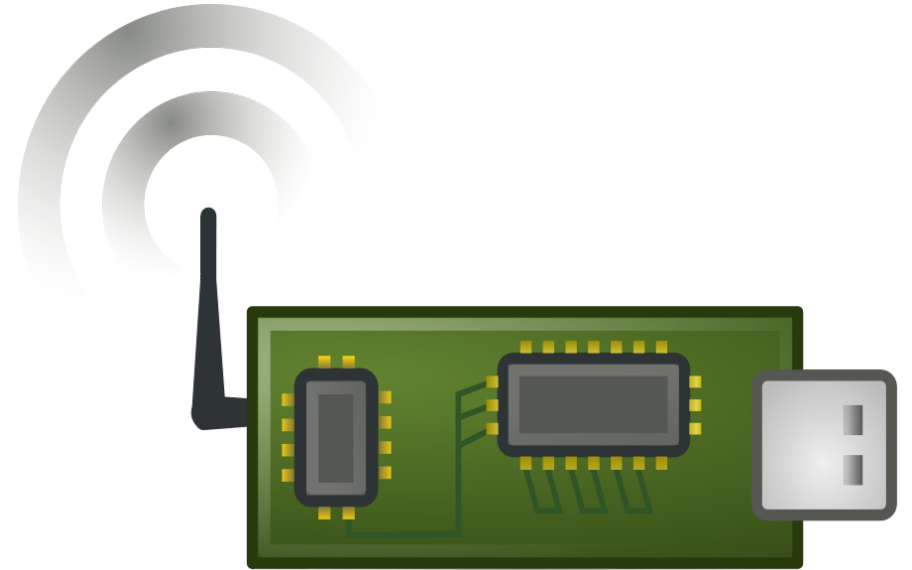


# CACHACA evaluates and classifies neighbors and services for each node

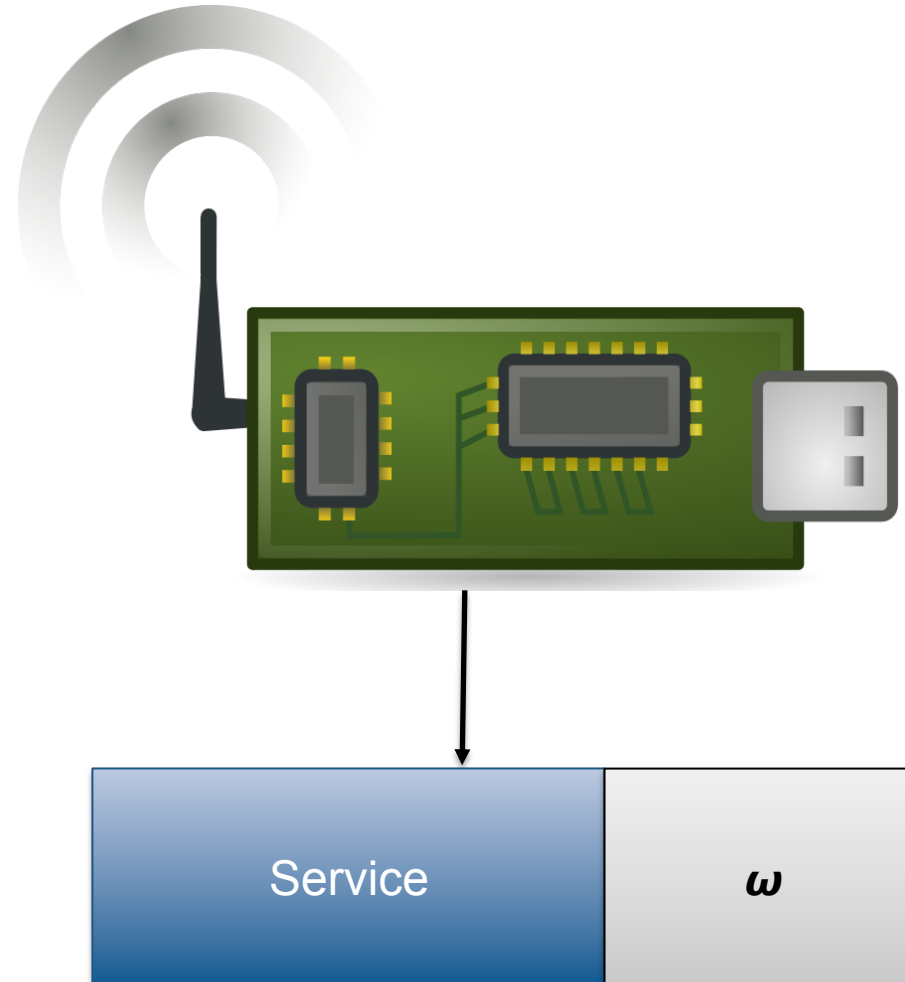
- extension of Neighbor Discovery protocols
- add info about “service(s)” offered by each node
- use Fuzzy logic to evaluate

# CACHACA - discovery

ID	RSSI	Timestamp	...	...	...
1	-50	1458148108	...		

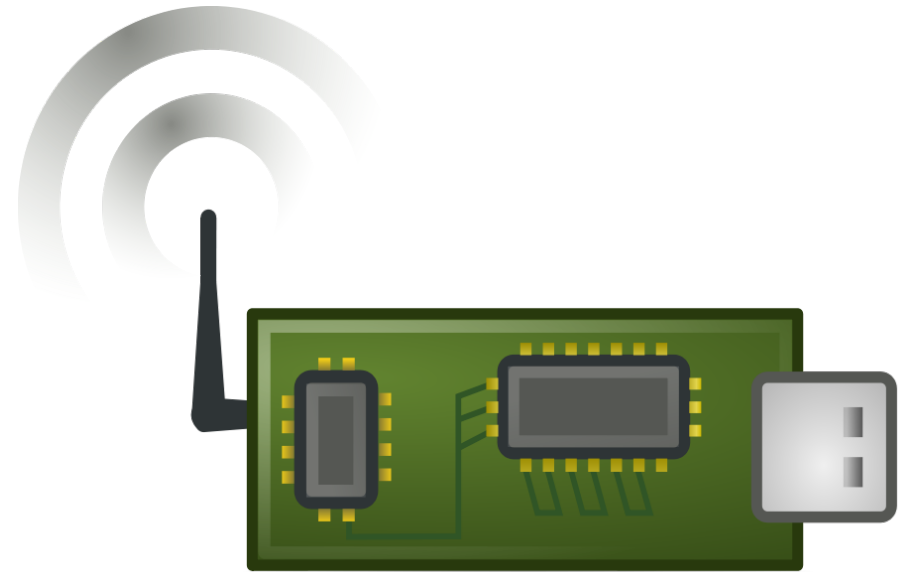


# CACHACA - discovery



# CACHACA - discovery

ID	RSSI	Timestamp	Service	$\omega$	$\varphi$
1	-50	1458148108	...		



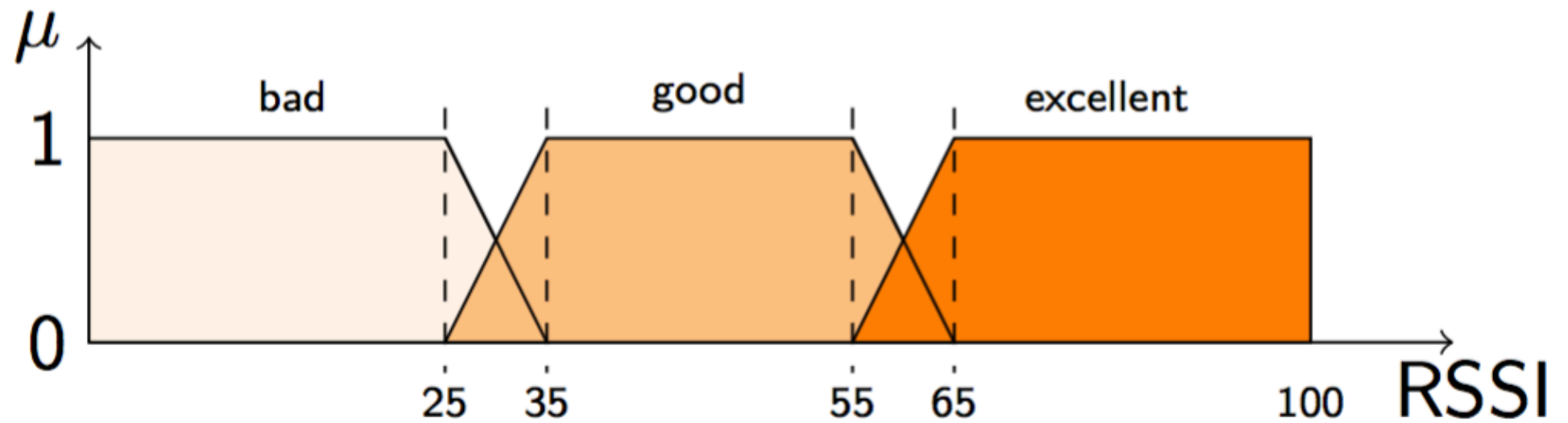
# CACHACA – evaluation

- Physical confidence ( $\varphi$ ): gives information about “physical” aspects of a neighbor
- Service confidence ( $\omega$ ): gives information about the service(s) provided by a neighbor



# CACHACA – evaluation $\varphi$

- RSSI
- $\Delta t$



# CACHACA – evaluation $\phi$

it prefers “fresh” nodes

RSSI	$\Delta t$	$\phi$
Excellent	Excellent	<b>Excellent</b>
Good	Excellent	<b>Excellent</b>
Excellent	Good	<b>Good</b>
...		
Bad	Bad	<b>Bad</b>

# CACHACA – evaluation $\omega$ it prefers real-time

$\varphi_{Neighbor}$	$\omega_{Neighbor}$	$\omega$
Excellent	Excellent	<b>Good</b>
Good	Excellent	<b>Good</b>
...		
Bad	Excellent	<b>Bad</b>

## CACHACA's neighbors table

ID	Service	$\omega$	$\varphi$	RSSI	Timestamp
1	temp	excellent	good	80	1431108000
30	light	good	good	50	1431108008
2	temp	excellent	excellent	90	1431108007

## ...takeaways

- Evaluate and Classify Neighbors and Services.
- extension of Neighbor Discovery protocols.
- $\varphi$  to evaluate physical properties.
- $\omega$  to evaluate the service(s).



# 3. Performance evaluation

# Smart Building



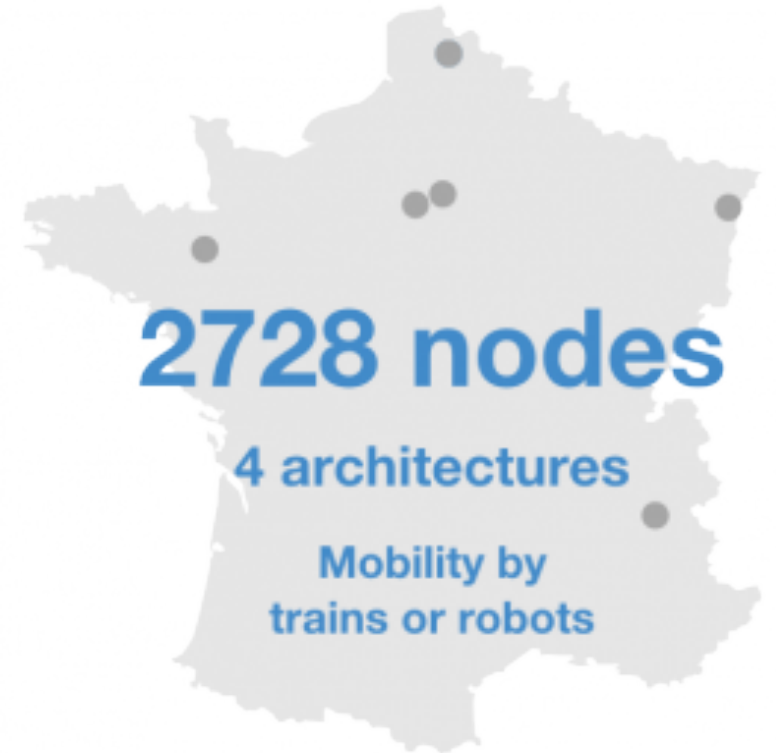
# Smart Building

Parameter	Value
Nodes Type	WSN 430
Nodes radio chip	TI CC 2420 @ 2.4 GHz
Nodes flash memory	1 MB
Contiki-OS	

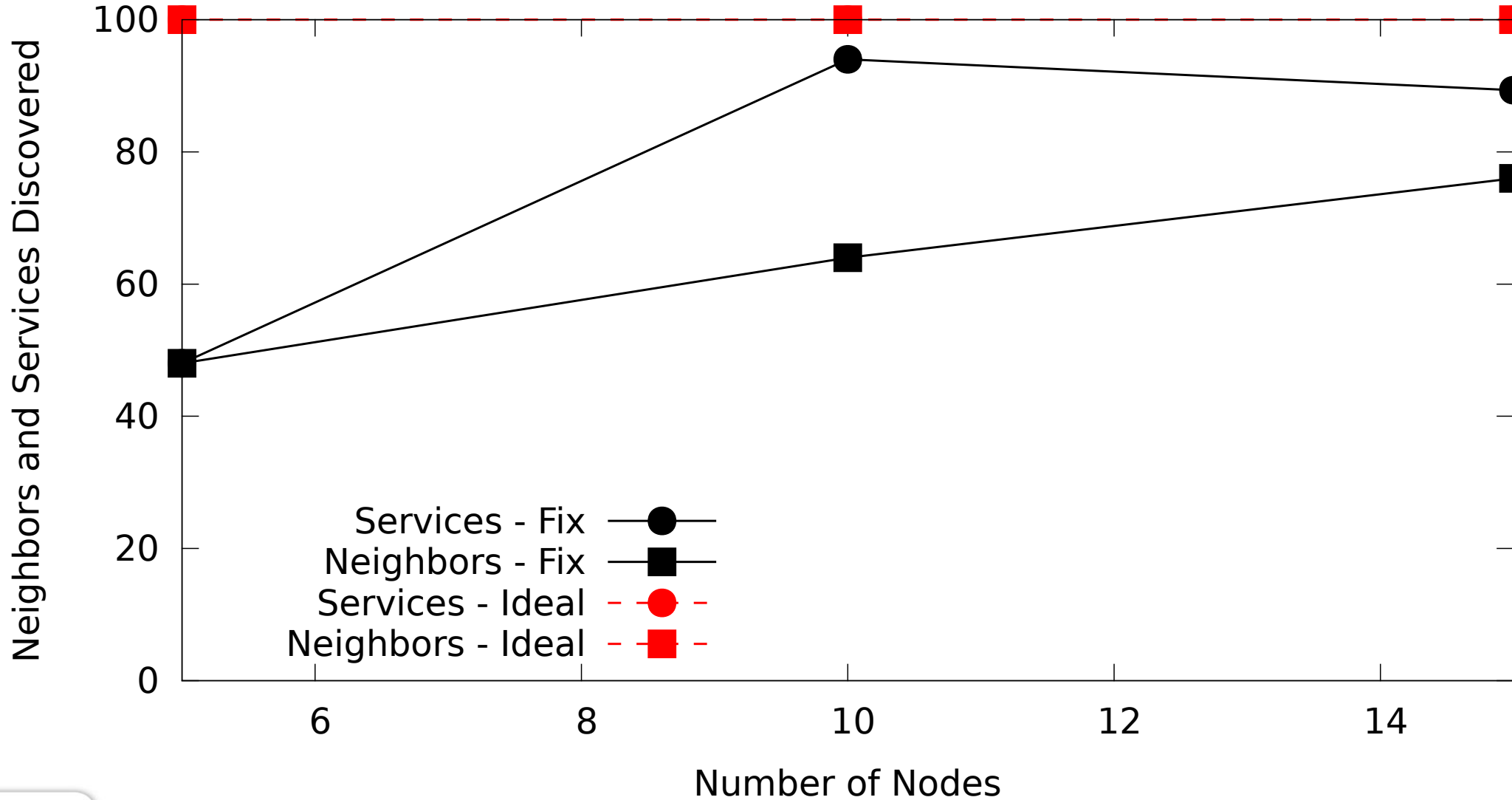




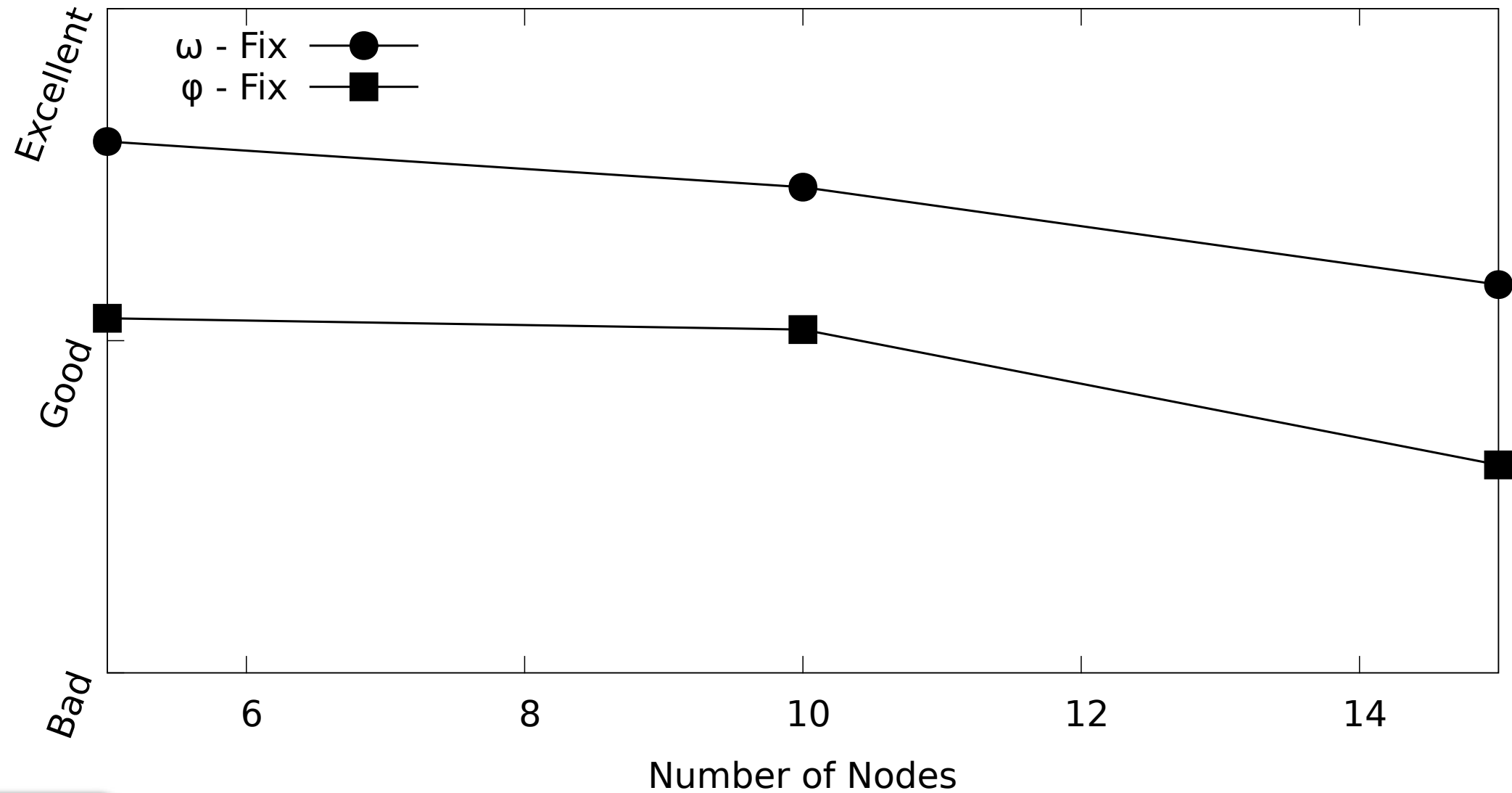
- scientific **testbed**
- provides very **large** infrastructure
- **testing** WSN and heterogeneous *objects*



# CACHACA discovers almost all the services available



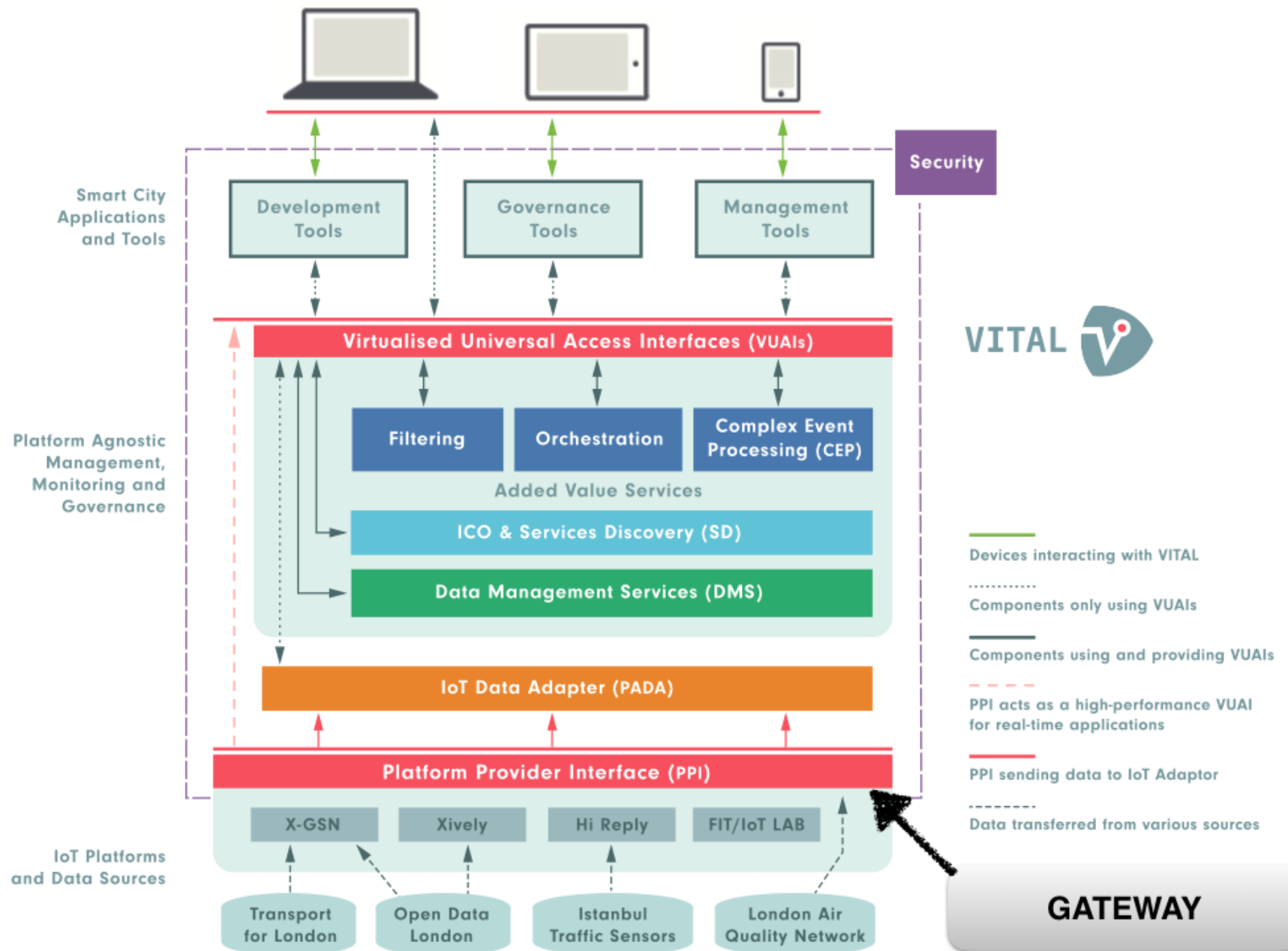
# CACHACA and its “confidences”



## takeaways...

- CACHACA deals with the Discovery and the Ranking of Neighbors and Services





## Future works

- Validate the Smart Building scenario
- Evaluation in high dense scenarios
- Consider other parameters for the confidences



Thanks!



*Inria*  
INVENTEURS DU MONDE NUMÉRIQUE

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