Valorisation de publication

Pourquoi faire une these ?

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What is IoT ?

Context

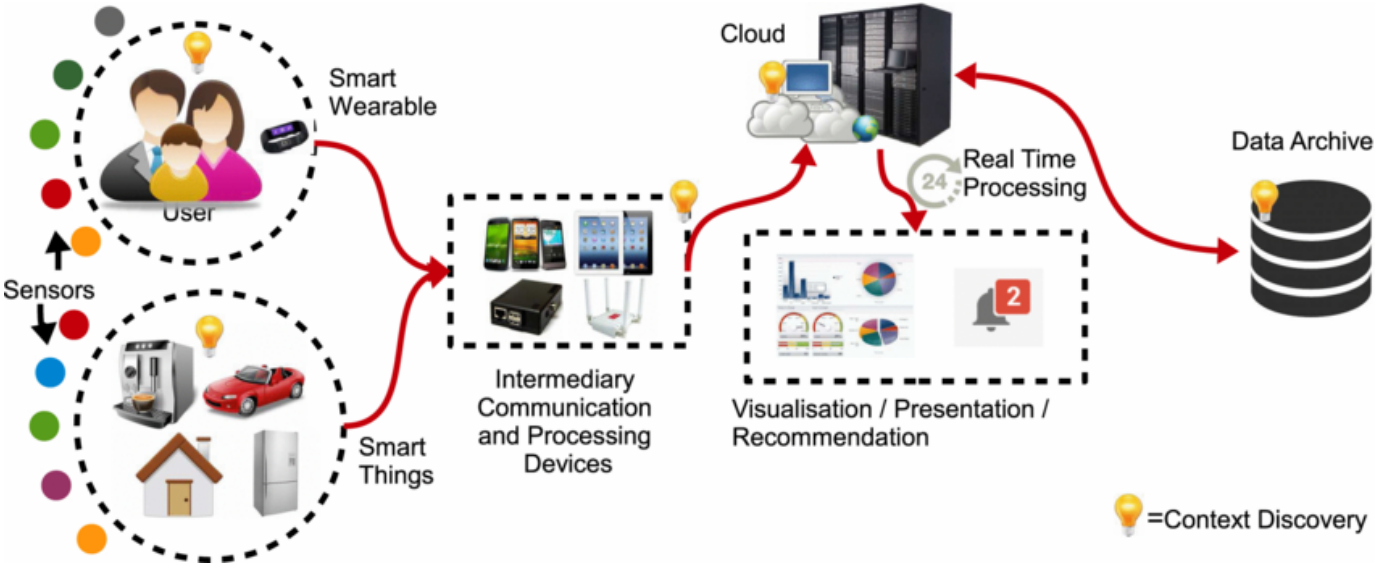


Figure 1: IoT platform.

Figure 2: IoT challenges.

IoT Applications requirements

Context

Challenges-Applications	Grids	EHealth	Transport	Cities	**Building**
Resources constraints	✗	✓	✗	-	✗
Mobility	✗	-	✓	✓	✗
Heterogeneity	-	-	-	✓	✗
Scalability	✓	-	✓	✓	-
QoS constraints	-	-	✓	✓	✓
Data management	-	✗	✓	✓	-
Standardization	-	-	-	-	✓
Amount of attacks	✗	✗	✓	✓	✓
Safety	-	-	✓	-	✓

Table 1: Main IoT challenges[1] ✓[2]

Figure 3: IoT Applications.

IoT Applications requirements

Context

Use Case	Packet rate () [packet/day]	Minimum success rate (Ps,min)	Grouping
Wearables	10	90	
Smoke Detectors	2	90	
Smart Grid	10	90	Group A PL = 10/20B
White Goods	3	90	
Waste Management	24	90	
VIP/Pet Tracking	48	90	
Smart Bicycle	192	90	
Animal Tracking	100	90	
Environmental Monitoring	5	90	
Asset Tracking	100	90	Group B PL = 50B
Smart Parking	60	90	
Alarms/Actuators	5	90	
Home Automation	5	90	
Machinery Control	100	90	
Water/Gas Metering	8	90	
Environmental Data Collection	24	90	
Medical Assisted Living	8	90	
Microgeneration	2	90	
Safety Monitoring	2	90	Group C PL = 100/200B
Propane Tank Monitoring	2	90	
Stationary Monitoring	4	90	
Urban Lighting	5	90	
Vending Machines Payment	100	90	
Vending Machines General	1	90	Group D PL = 1KB

Table 2: Application requirements for the use cases of interest [3] [2].

Wireless communication

Context

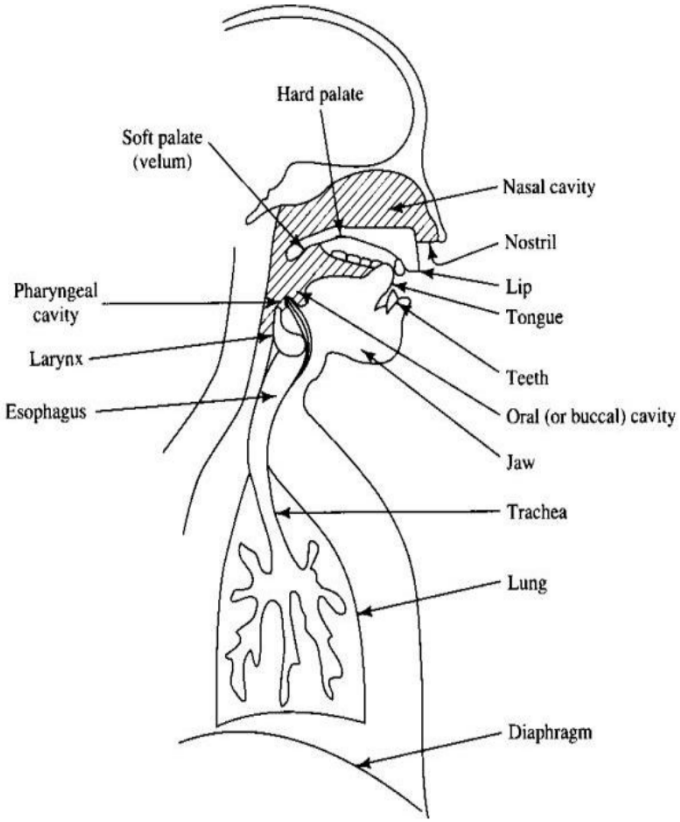


Figure 4: Human voice.

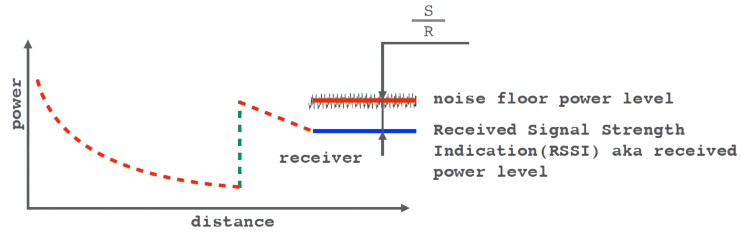


Figure 5: SNR.

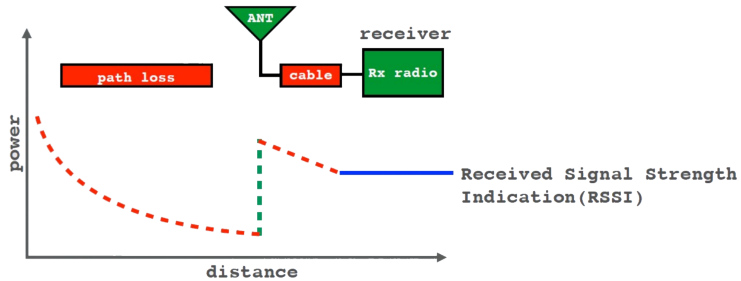
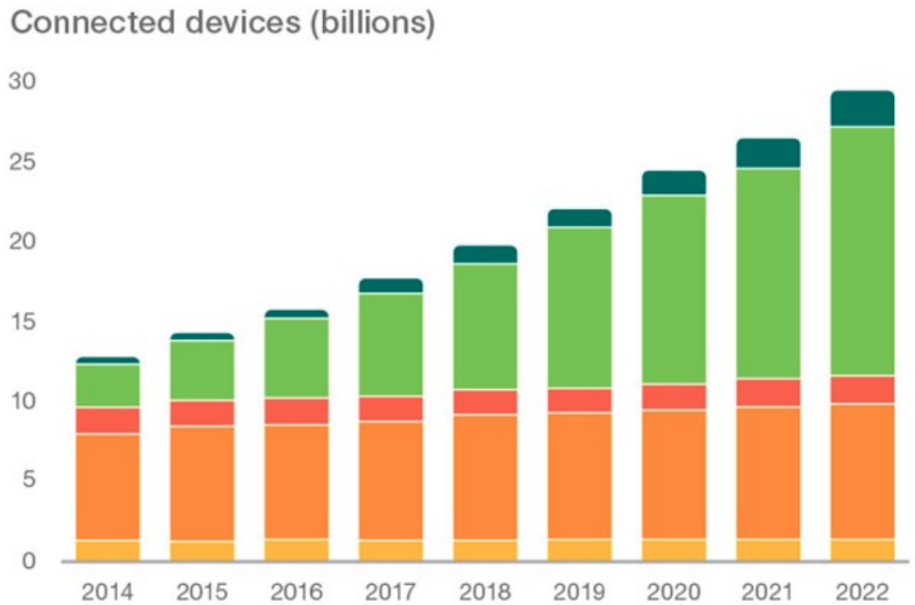


Figure 6: RSSI.

Figure 7: Time on air.

IoT devices

Context



	2016	2022	CAGR
Wide-area IoT	0.4	2.1	30%
Short-range IoT	5.2	16	20%
PC/laptop/tablet	1.6	1.7	0%
Mobile phones	7.3	8.6	3%
Fixed phones	1.4	1.3	0%
	16 billion	29 billion	10%

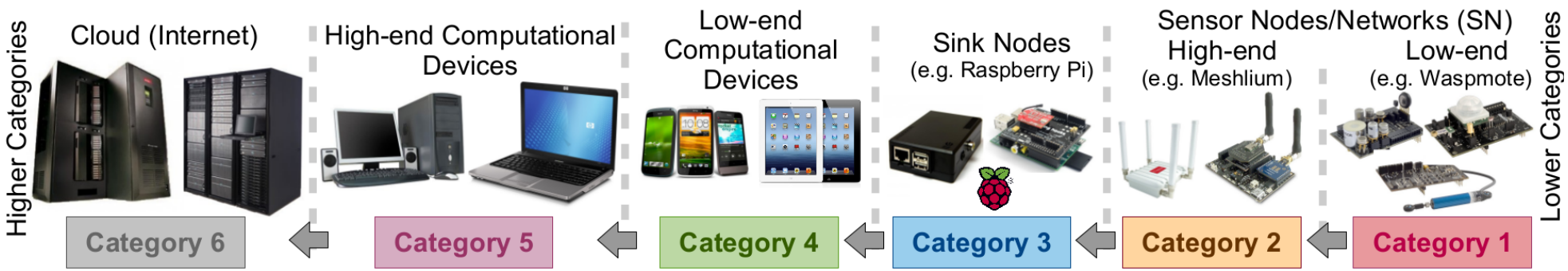


Figure 8: IoT devices [4].

Problematic

Where is the problem ?

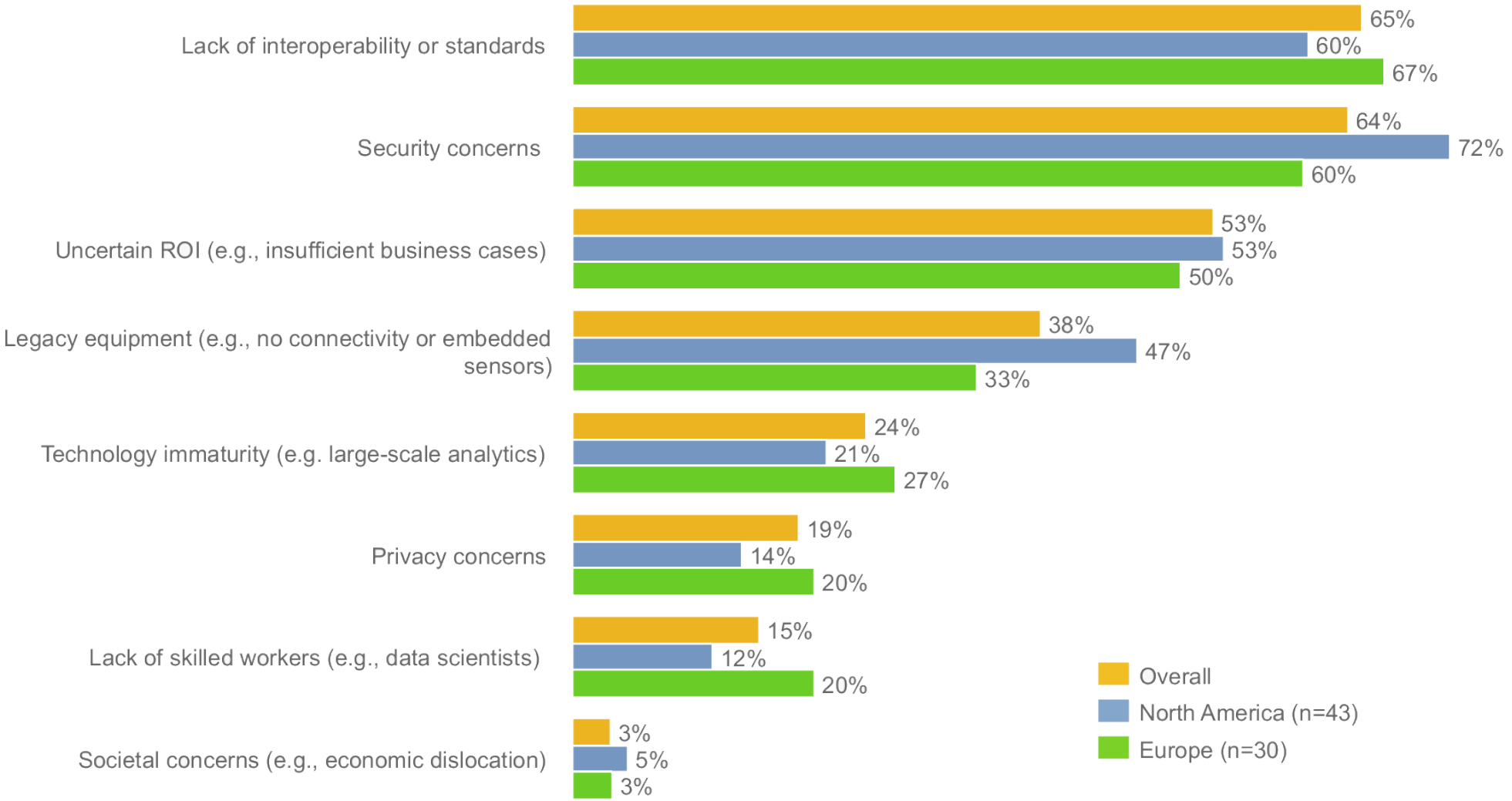


Figure 9: Key barriers in adopting the Industrial Internet [5].

Problematic

Where is the problem ?

- Some network configuration are static and not adptive to the application
  - Decision and optimisation problem..
  - Various network acces
  - Various configuration of each network acces
  - Lake of selection tools

- Users have to select the network and the application
  - How to select the **best** network.
  - How to select the network required by the application.

Network slicing

Motivations

- a
  - Lake of selective tools
  - How to select the **best** access point
- QoS Analysis
  - a
  - Lake of selective tools
  - How to select the **best** access point
- Threats
  - a
  - Lake of selective tools
  - How to select the **best** access point

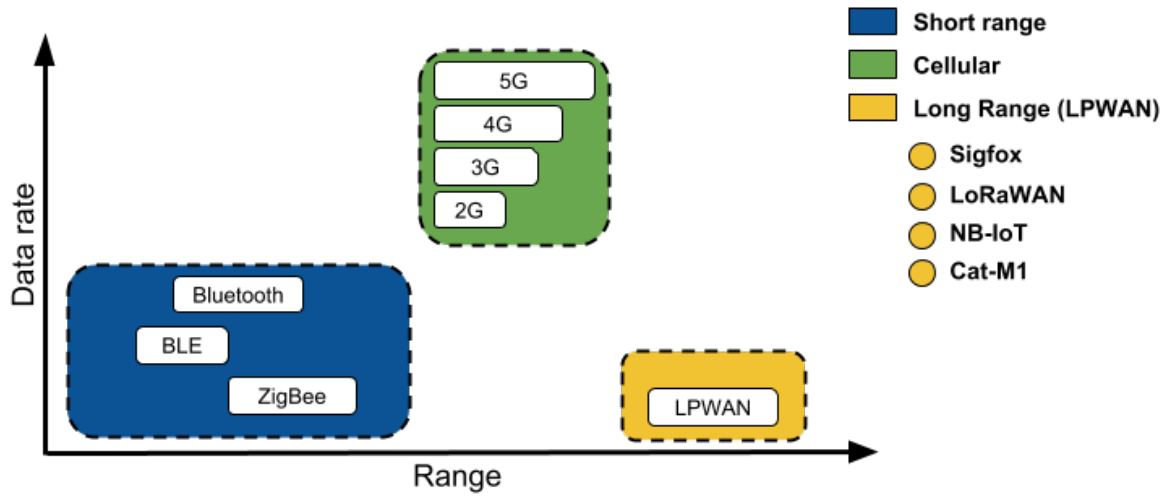


Figure 10: Communication diversity.

Network slicing

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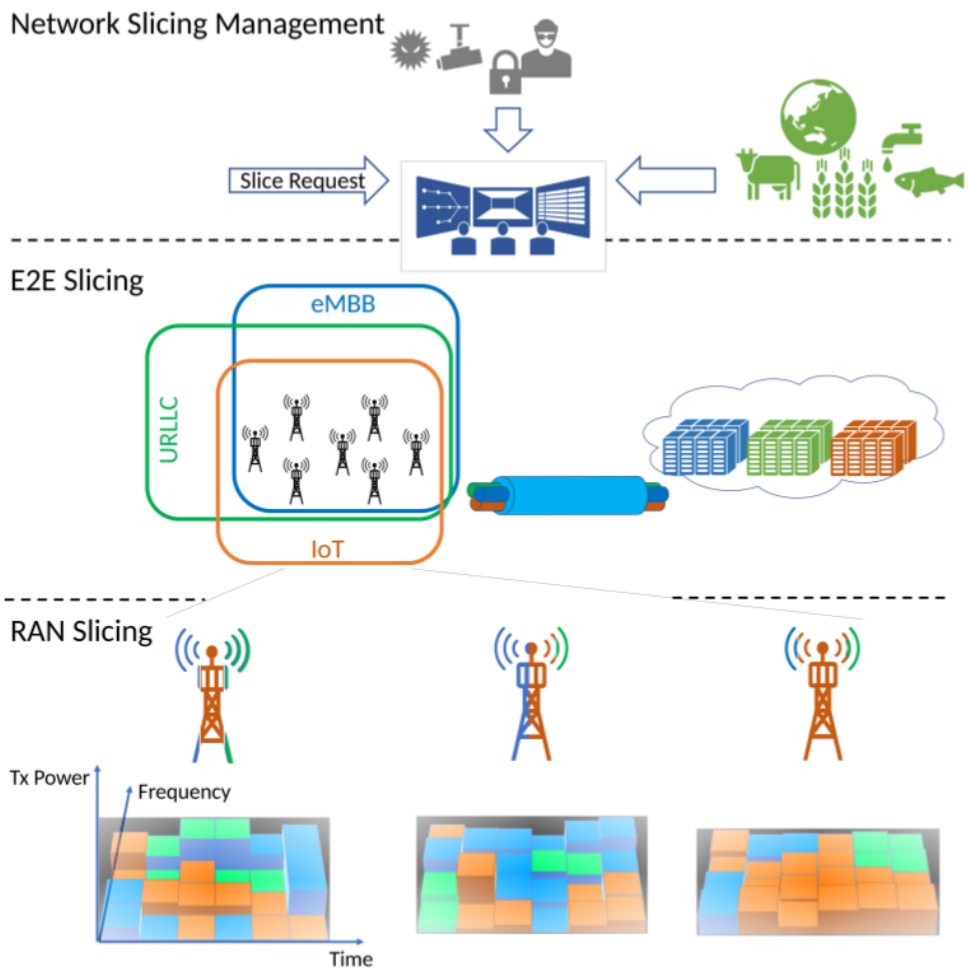

Figure 11: Network slicing [6].

Network slicing

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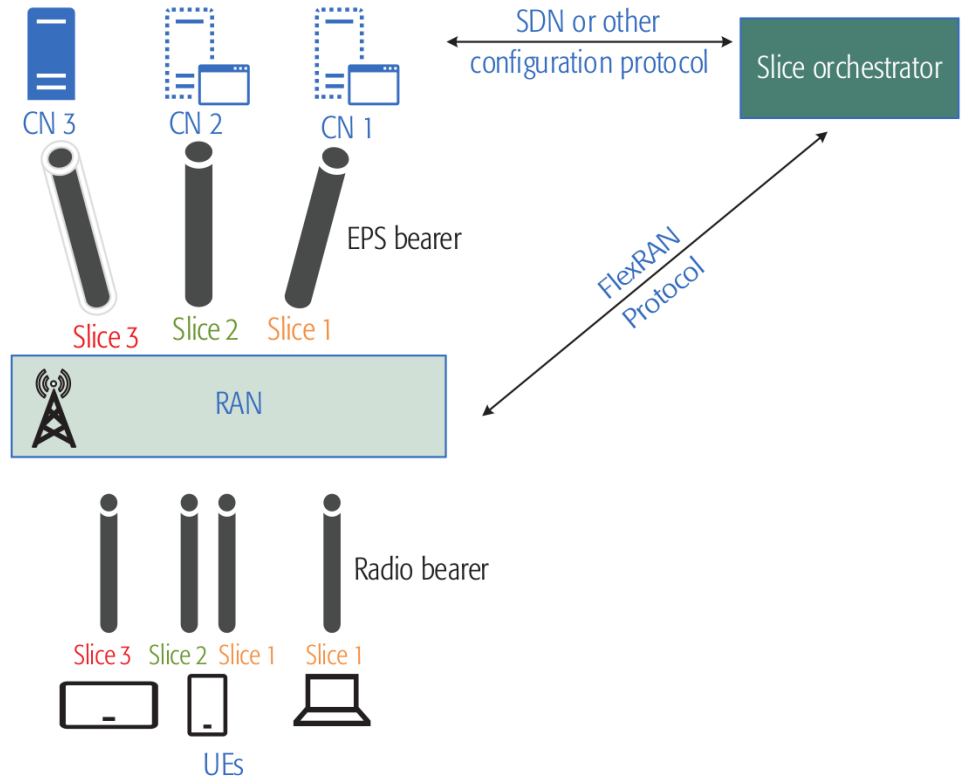

Figure 12: Network slicing [7].

Network slicing

Motivations

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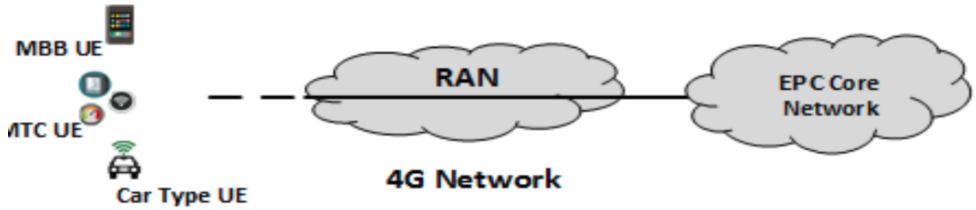
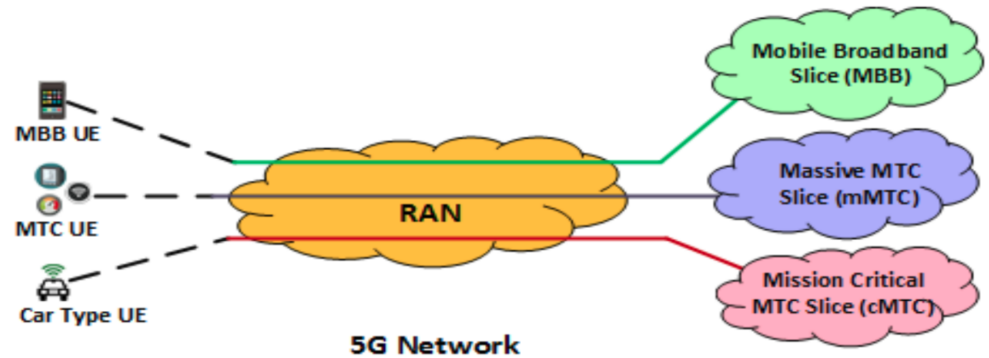


(a) 4G without network slicing.



(b) 5G with network slicing.

Figure 13: Network slicing concept [8].

Goal

What is the goal ?

- Allow heterogeneous network to communicate
- QoS Analysis
- Threats

- How to select the **best** access point
  - Allow heterogeneous network to communicate
  - QoS Analysis
  - Threats

Figure 14: wsn-IoT.

Goal

What is the goal ?

- Allow heterogeneous network to communicate
- QoS Analysis
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- How to select the **best** access point
  - Allow heterogeneous network to communicate
  - QoS Analysis
  - Threats

Figure 14: wsn-IoT.

How to adapt the network to applications ?

Challenges

Where is the difficulty ?

- Reasonable and acceptable delay before the decision appears.
- Cope with the different view points and goals of the operators and the users.
- React to the changing environment conditions.
- Allow any type of inputs and to be applicable to any type of ANs.
- Handle the increasing number of RATs and the large number of criteria.

Contributions

Contributions

- Use cases (Requirements)
  - Smart building: Videos, Voice, Text.
  - Smart trafic: Videos, Voice, Text
- Environnements
  - Rural/Urban
  - Static/Mobile
  - Tempirature
- Senarios
  - For each application protocol (MQTT, COAP, XMPP)
  - For each network protocol (Start, Mesh)
  - For each MAC protocol (LoraWan, Sigfox, ...)
- Algorithms
  - Input:
    - Service QoS metrics requiremnts
    - MAC configuration (SF, CR, BW, ...)
    - Network QoS metrics
  - Method:
    - MADM, Game, Neural
  - Outputs:
    - Ranked networks

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Theoretical, Simulation & Real environnement

Contributions

Contributions

- Network selection
  - MADM
    - Ranking methods
    - Ranking & weighted methods
  - Game theory
    - Users vs users
    - Users vs networks
    - Networks vs network
  - Fuzzy logic
    - as a score method
    - another theory
  - Utility function
    - 1
    - 2

References

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