

Valorisation de publication

Pourquoi faire une these ?

Aghiles DJOUDI

PhD student
LIGM/ESIEE Paris & ECE Research Lab Paris

September 12, 2019



Why I started a PhD ?

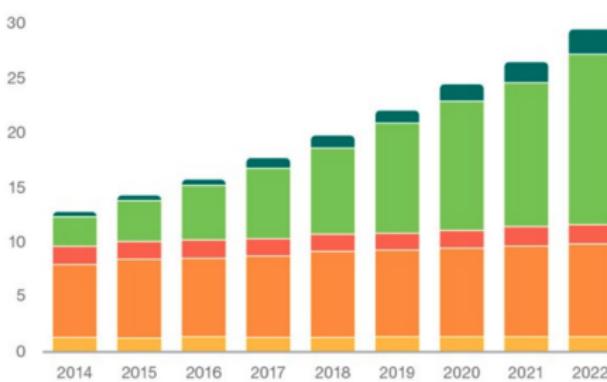
3 main reasons

- ➡ Research methodology lecture.
- ➡ Bac+5 in networking ? not really !
- ➡ Being paid to study and develop yourself !

IoT devices

IoT devices are useless without a good communication capability

Connected devices (billions)



	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%

Higher Categories



Category 6

High-end Computational Devices



Category 5

Low-end Computational Devices



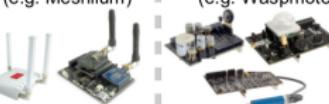
Category 4

Sink Nodes
(e.g. Raspberry Pi)



Category 3

Sensor Nodes/Networks (SN)
High-end
Low-end
(e.g. Meshlium)
(e.g. Wasp mote)



Category 2

Lower Categories



Category 1

Figure 1: IoT devices [1].

IoT applications requirements

Each application has its own communication requirements

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

Table 1: Main IoT challenges [2] [3]



Figure 2: IoT Applications.

IoT platforms

IoT platforms is a chain of communication process

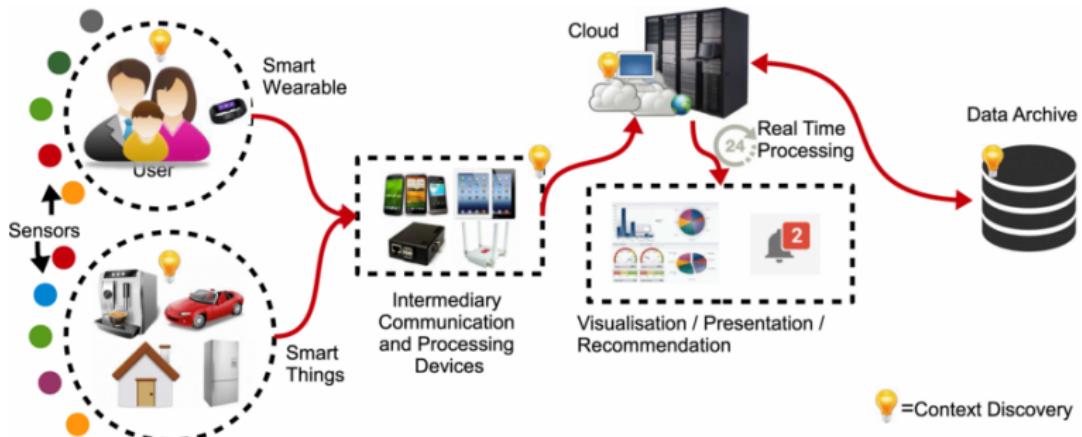


Figure 3: IoT platform.



Figure 4: IoT challenges.

IoT wireless communication

Wireless communication performance need to be evaluated to match applications requirements

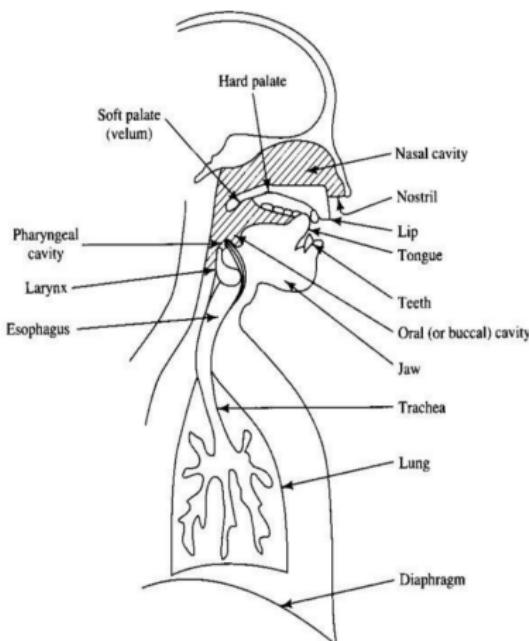


Figure 5: Human voice.

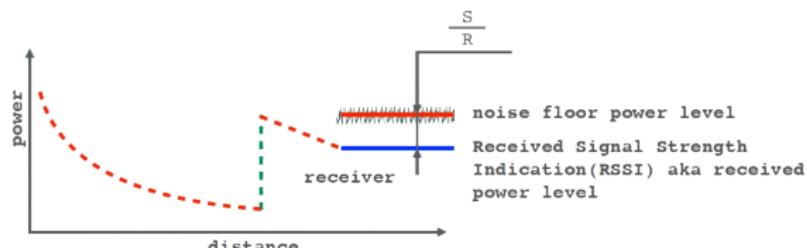


Figure 6: SNR & RSSI.



Figure 7: Time on air.

Problematic

Network configuration is the problem number one actually

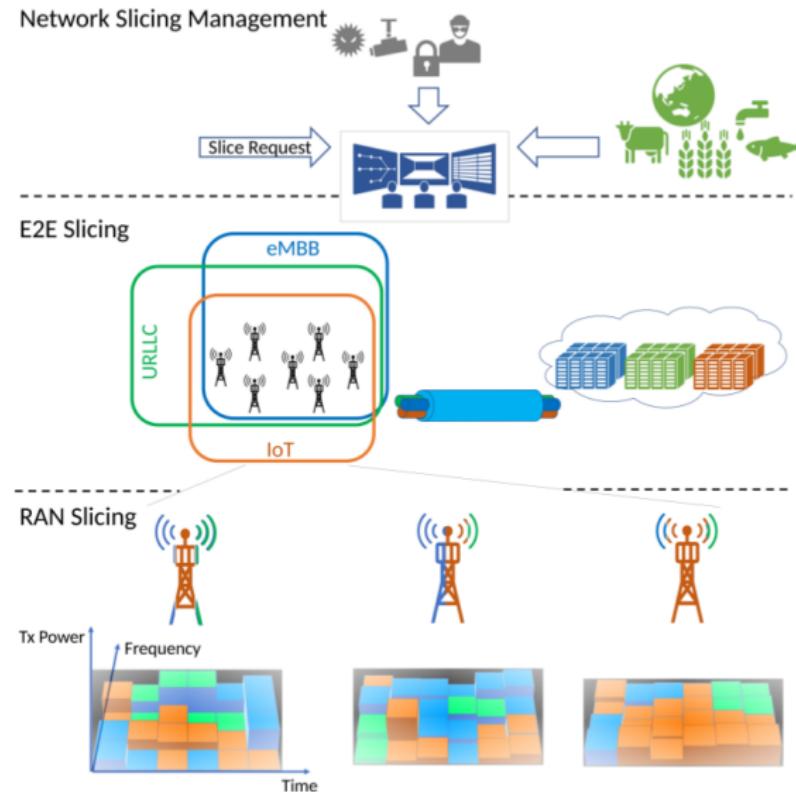


Figure 8: Key barriers in adopting IoT in the industry [4].

Problematic

Network configuration is the problem number one actually

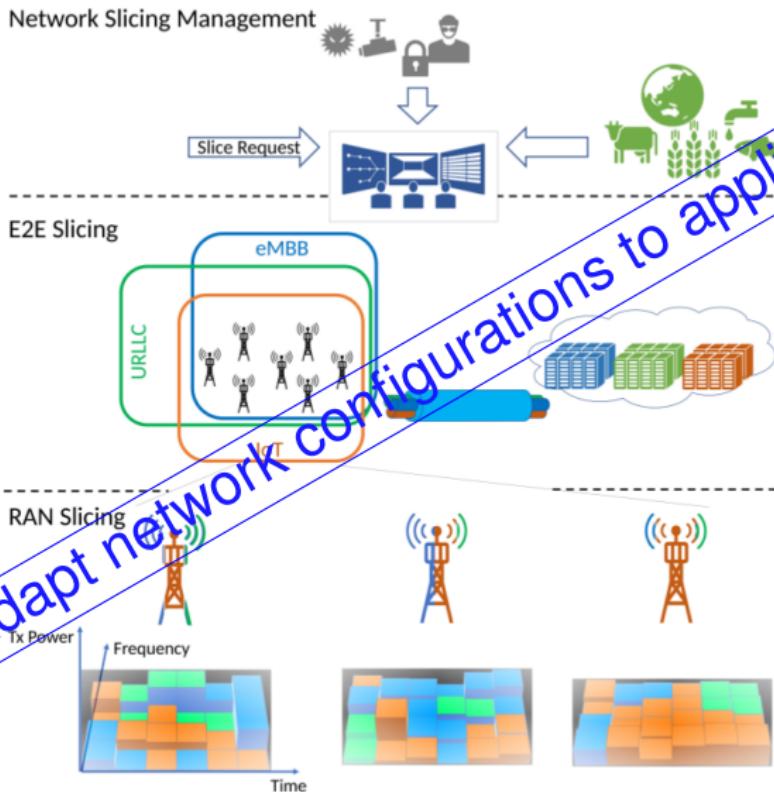


Figure 8: Key barriers in adopting IoT in the industry [4].

Network slicing

Exp: 4G/5G, Content provider (GAFA) want to be directly connected to users devices

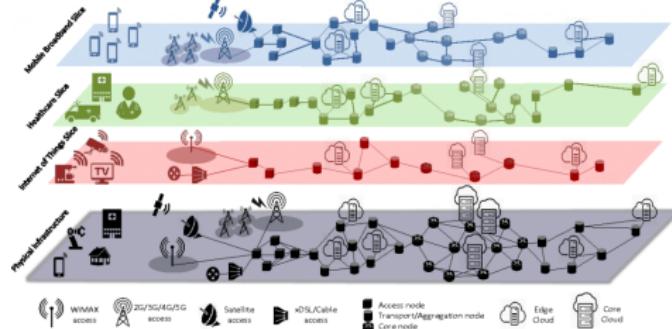
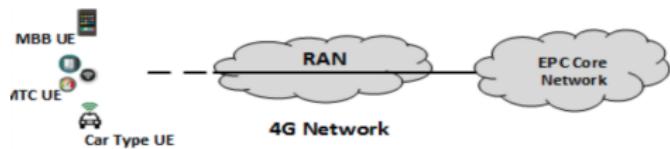
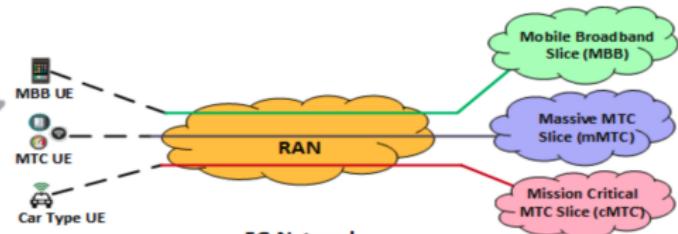


Figure 9: Network slicing [4].



(a) 4G without network slicing.



(b) 5G with network slicing.

Figure 10: Network slicing concept [5].

Conclusion

In the future, network administration function will disappear and will be replaced by a slice orchestrator

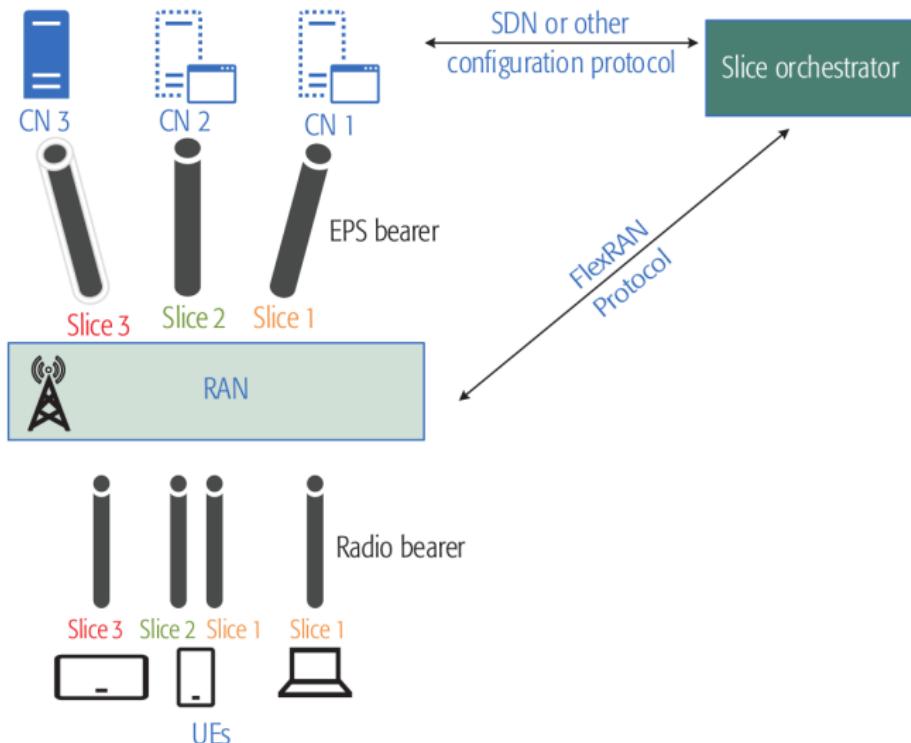


Figure 11: Slice orchestrator [6].

Conclusion

In the future, network administration function will disappear and will be replaced by a slice orchestrator

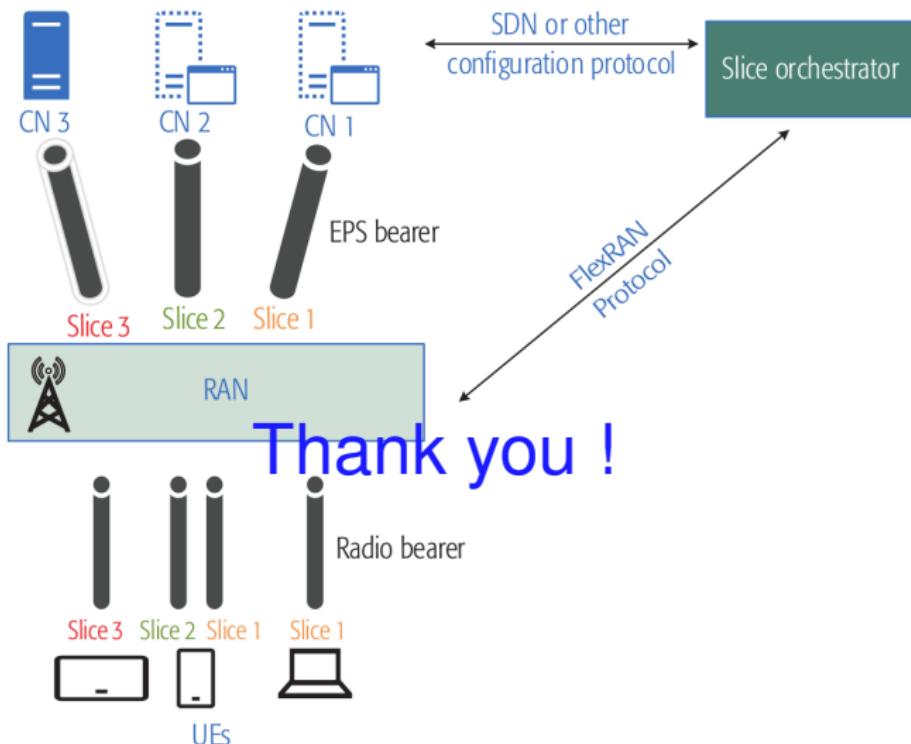


Figure 11: Slice orchestrator [6].

References

- [3] V. Prasanna Venkatesan, C. Punitha Devi, and M. Sivarajanji. " Design of a Smart Gateway Solution Based on the Exploration of Specific Challenges in IoT ". In: *2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC)*. 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC). 00004. Palladam, Tamilnadu, India: IEEE, Feb. 2017, pp. 22–31.
- [1] Charith Perera et al. " MOSDEN: An Internet of Things Middleware for Resource Constrained Mobile Devices ". In: (Oct. 15, 2013). 00107. arXiv: 1310.4038 [cs].
- [2] Djamel Eddine Kouicem, Abdelmadjid Bouabdallah, and Hicham Lakhlef. " Internet of Things Security: A Top-down Survey ". In: *Computer Networks* 141 (Aug. 4, 2018). 00029, pp. 199–221.
- [4] Vincenzo Sciancalepore, Marco Di Renzo, and Xavier Costa-Perez. " STORNS: Stochastic Radio Access Network Slicing ". In: (Jan. 16, 2019). 00001. arXiv: 1901.05336 [cs, math].
- [5] Malla Reddy Sama et al. " Service-Based Slice Selection Function for 5G ". In: *2016 IEEE Global Communications Conference (GLOBECOM)*. GLOBECOM 2016 - 2016 IEEE Global Communications Conference. 00016. Washington, DC, USA: IEEE, Dec. 2016, pp. 1–6.
- [6] Adlen Ksentini and Navid Nikaein. " Toward Enforcing Network Slicing on RAN: Flexibility and Resources Abstraction ". In: *IEEE Communications Magazine* 55.6 (2017). 00063, pp. 102–108.