

# Connectivity side protocols for devices

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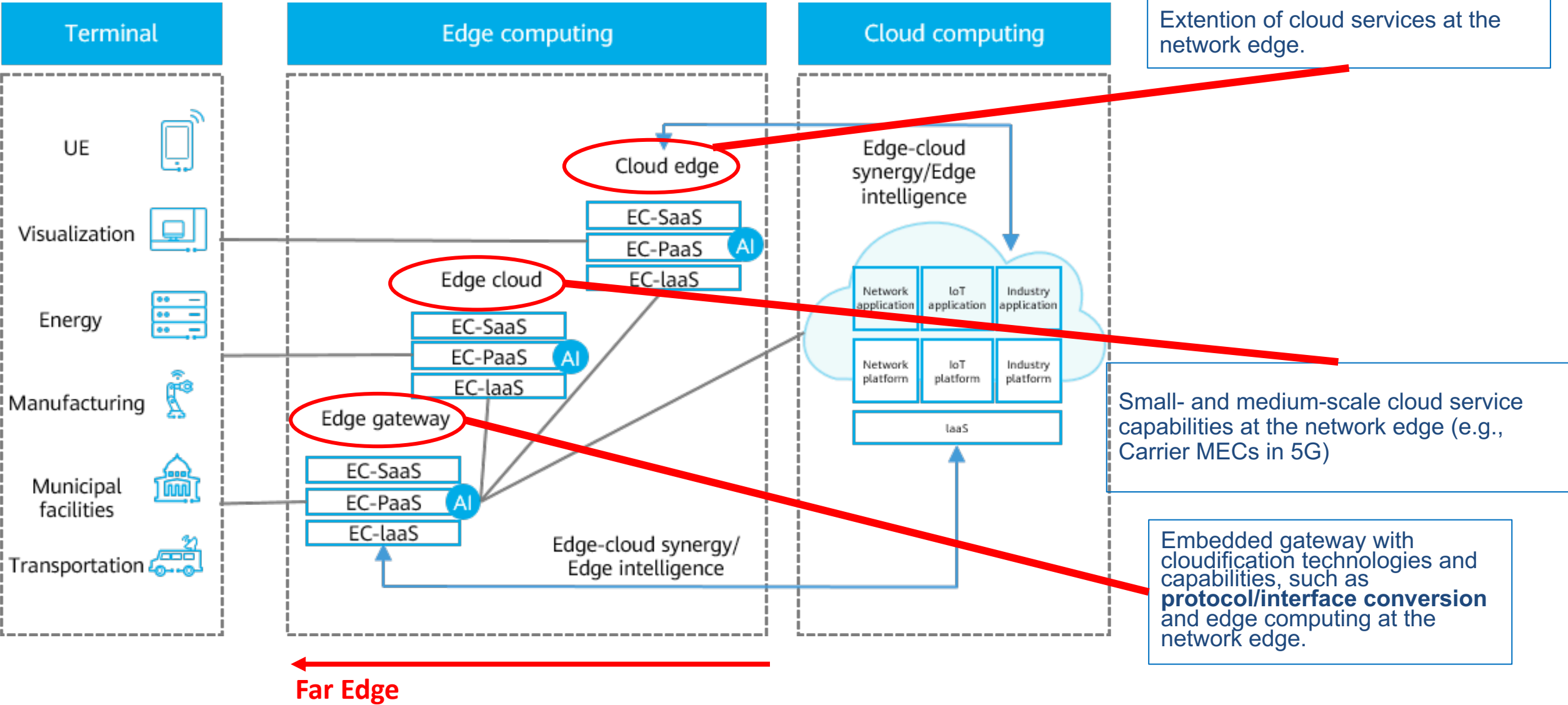
# Preliminaries



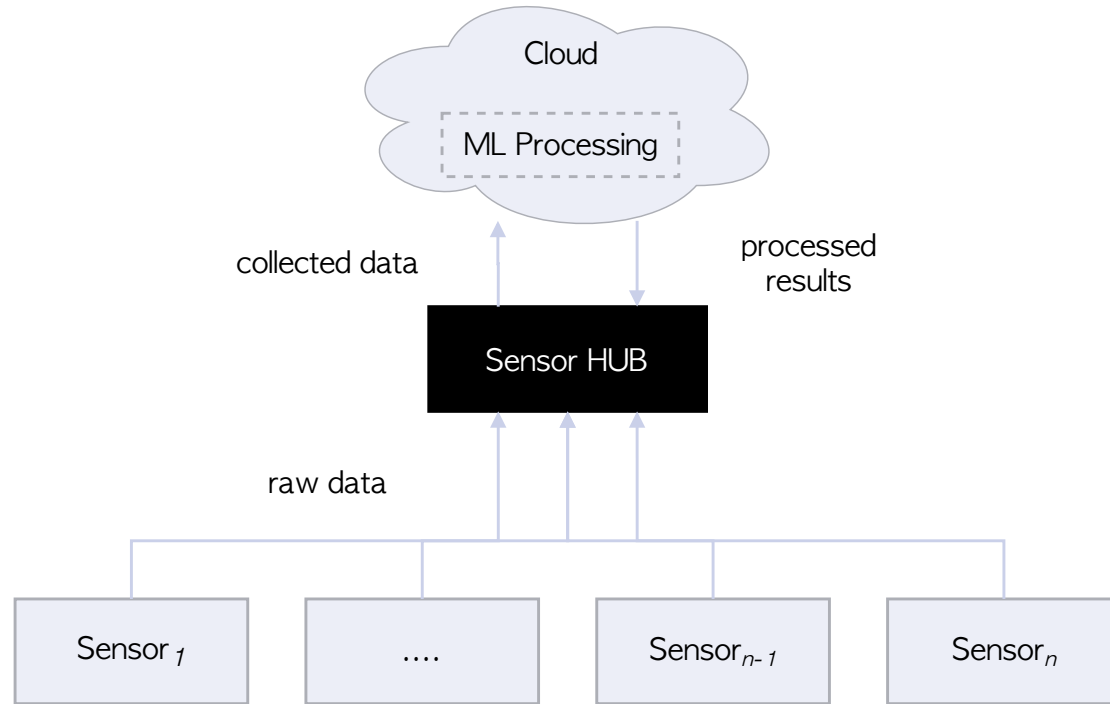
- Keywords in the title
  - “Devices” → Things → Internet of Things
  - “Connectivity Side Protocols” → fundamental to connect Devices (Things) to the Cloud
- A change in perspective: from IoT to AIoT
  - Internet of Things → collect data from all things → big data
  - Artificial Intelligence of Things → process data and extract information → relevant data
- Key role of the Edge (in particular, of the Far Edge)
  - The edge embeds intelligence → brings the cloud closer to devices
- ARTEMIS has identified 6 focus areas\* (key technologies)
  - In most of the these key technologies **connectivity** plays a key role
  - Connectivity tightly coupled with **security**

\* D. Serpanos, G. Ferrari, G. Nikolakopoulos, J. Perez, M. Tauber, and S. Van Baelen, "Embedded Artificial Intelligence: the ARTEMIS vision," *IEEE Computer*, vol. 53, no. 11, November 2020, pp. 65-69. DOI:10.1109/MC.2020.3016104.

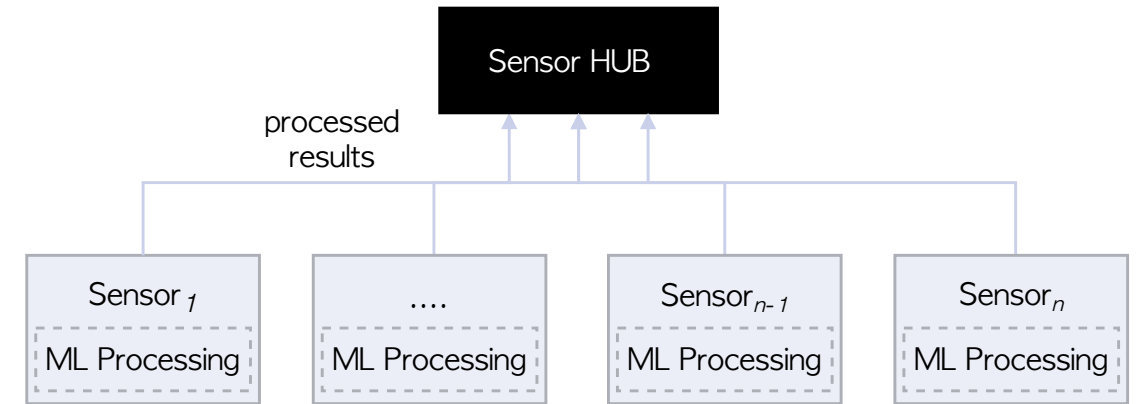
# Edge Computing: in the “Middle”



# Example: Sensor Networks with Local Intelligence



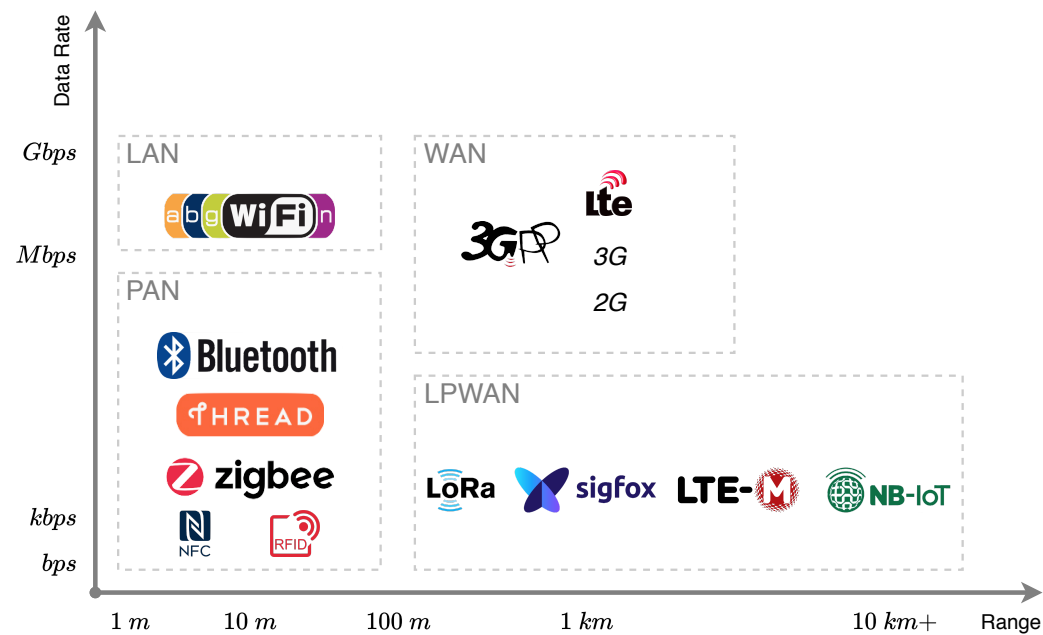
Cloud Solution



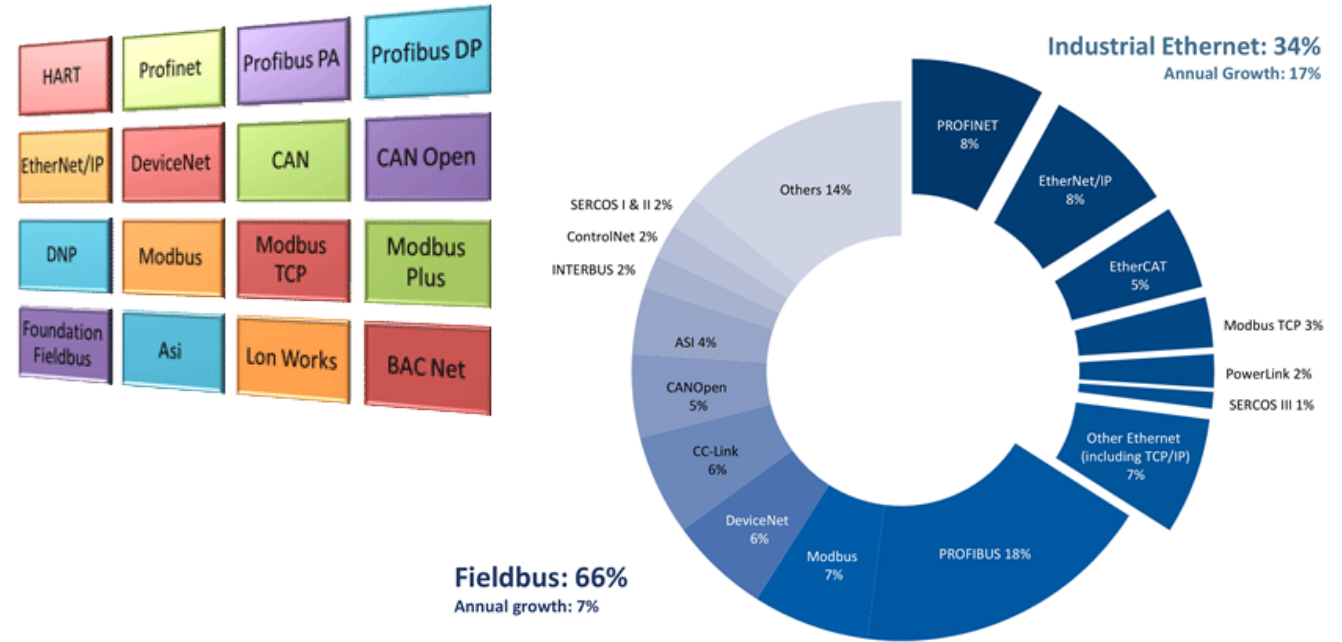
Local Intelligence

# Connectivity Protocols

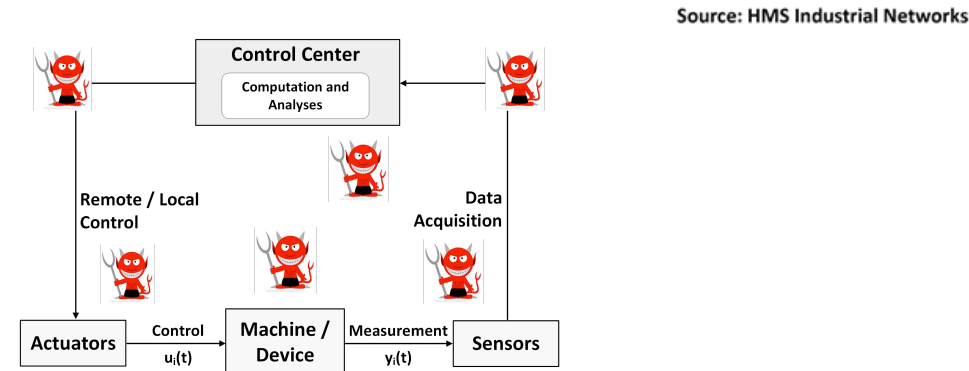
**Wireless** connectivity protocols with heterogeneous performance (data rate and range)



**Wired** connectivity protocols: fieldbus protocols vs industrial Ethernet



Overall goal: make protocols **interoperable** → foster the implementation of **systems of systems**, taking into account **security**



Source: HMS Industrial Networks

# Conclusions

- Current connectivity protocols: intelligence-agnostic
- A new perspective: connectivity protocols will need to embed intelligence to make the interactions between the far edge and the devices more effective
- Several challenges lay ahead for future `intelligent` connectivity side protocols for devices
  - Embedding intelligence effectively
  - Interoperability (heterogeneous protocols)
  - Trade-offs (distributed computation vs transmission)
  - Security (processing vs transmission)
- With proper connectivity side protocols, the Far Edge will be the enabler of AIoT



Gracie

