Edge computing based applications in vehicular environments:
comparative study and main issues

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Why Edge Computing should be integrated in the vehicular environment?

- Vehicular networks are supporting new applications with different characteristics and various needs

- The most common approach, based on Cloud Computing, presents some limitations in terms of:
    - QoS (latency, bandwidth)
    - Scalability
    - Security

- Edge Computing is an interesting new approach for vehicular applications
    - provides additional and near computational and storage capabilities, in order to achieve:
        - Lower latency
        - More bandwidth
        - Higher scalability

Edge computing-based networks: Technologies comparison

Edge Computing technologies	Supporting companies
Cloudlet	Service providers (Open Edge Computing Initiative)
Mobile Edge Computing (MEC)	Network operators (ETSI ISG)
Fog Computing (FC)	Manufacturers (Open Edge Consortium)

- Thus, the considered (three) technologies present different characteristics in terms of:
    - Architecture
    - Operation (proximity, etc.)
    - Computational and storage capabilities (location, performances, etc.)
    - Used techniques and tools (context-awareness, etc.)

Edge computing-based vehicular application

- For each Edge Computing technology, different vehicular applications were proposed:
    - implying some challenges (QoS, mobility, scalability, security, etc.)
    - using different approaches (content caching, resource management, etc.)

- For each application, we studied:
    - the Edge Computing technology choice and the approach
    - the benefits and the features
    - the remaining challenges

- For different vehicular applications, we defined the more suitable Edge Computing technology depending on its requirements: *cost*, *latency, storage and computational capabilities, etc.*

Technology	Applications
Cloudlet	Infotainment, Advertising, Transport Management, etc.
Fog Computing	Road Safety applications, Driver Assistance, etc.
Mobile Edge Computing	Transport Management, Network Services, etc.

Open issues and future directions

- The integration of Edge Computing within the vehicular environment is not without challenges

- Some of these challenges were addressed in the various studied work

- Different improvements should be considered for each Edge Computing technology

- Some challenges remain without [complete] answers:
    - Security and privacy
    - Communications reliability
    - Applications placement
    - Integration in the future ecosystem (5G networks)