Internet of things for electric vehicles

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Cloud computing and IoT based VANET networks

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Cloud Computing and VANET

- Data processing: Big data from the vehicle is processed in the cloud.
- Data storage: Centralized storage of traffic and route data.
- Application support: The cloud enables complex navigation and prediction applications to run.

The role of IoT in VANET networks

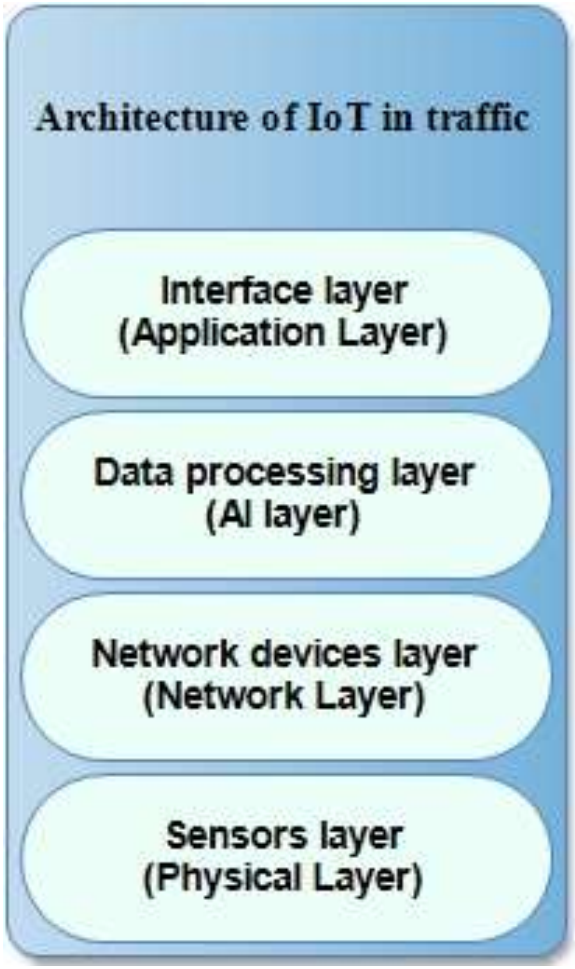
- Sensors in vehicles: Collecting data on speed, position, temperature, etc.
- Infrastructure connectivity: Traffic lights, smart roads and cameras communicate with vehicles.
- Automation: IoT enables autonomous reactions in real time.

Architecture of IoT based VANET networks

Four layers architecture :

1. Sensor layer (physical layer),
2. Network device layer (network layer),
3. Data processing layer (AI layer)
4. Application layer (interface layer).

•Cloud works as central point for the analysis.



Advantages **of Cloud Computing integrations and IoT in VANET networks**

- **Scalability**: Possibility processing big quantities data.
- **Faster reaction**: Real-time analysis data in the cloud.
- **Reduced costs**: Optimization resources by the way sharing infrastructure.

Security challenges in Cloud-IoT VANET networks

- **Attacks on Privacy**: Tracking vehicles via IoT sensors .
- **Attacks on cloud**: Theft data or DoS attacks on servers .
- **Manipulation data**: False information which affect on decisions driver .

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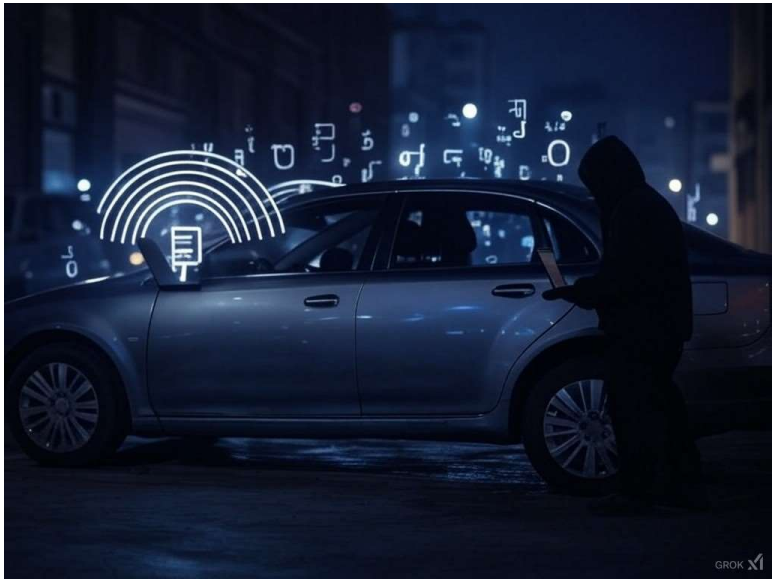
IoT challenges in VANET networks

- **Limited energy and resources**: IoT devices have limited batteries and processor strength.
- **Standardization**: Various standards make difficult integration.
- **Security**: IoT devices are frequent goal attacks.



Security solutions for Cloud-IoT VANET networks

- **Encryption Data**: Insurance confidentiality during transmission and storage.
- **Authentication**: Verification identity vehicles and users.
- **AI for detection Attack**: Automatic identification network anomaly.

Integration of blockchain technology

- **Security data**: Blockchain enables unchangeable records transaction.
- **Decentralization**: Reduction leaning on central servers.
- **Applications**: Payments, authentication and records traffic events.

Case study: Smart cities

- **Example**: Cities using Cloud-IoT VANET networks for management traffic.
- **Results**: Reduction congestion, increased security and better mobility.
- **Challenges**: High expenses of implementations and maintenance.

Economic benefits

- **Cost reduction**: More efficient management by traffic and resources.
- **New industries**: Development of applicationa and services for smart vehicles.
- **Employment**: Creation of working places in the industry of technology.

Ecological aspects

- **Less CO2 emissions**: Through optimization traffic pollution is reduced.
- **Smart energy consumption**: IoT devices optimize fuel and electricity consumption.
- **EV Incentive**: Better electrical infrastructure for vehicles.

Trends and future directions of development

- **5G networks**: Faster and more reliable communication for VANET.
- **Autonomous vehicles**: Integration with advanced data processing systems.
- **Edge computing**: Local processing data for reduction delays .
- **Advanced IoT sensors**: Larger precision and efficiency.

Conclusion

- Cloud-IoT based VANET networks represent key step towards smart traffic .
- Although there are challenges, advantages in security, economy and ecology are huge .
- Future depends on cooperation industries, government and scientific communities .

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