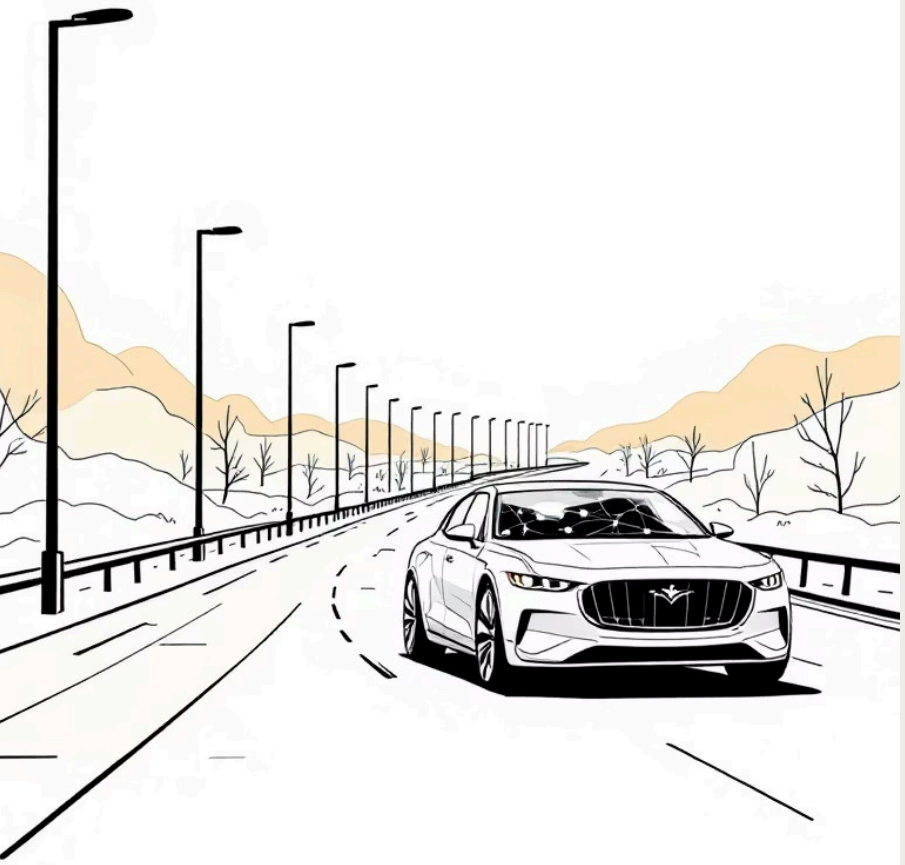

IoT Applications: Connected Vehicles & Telematics

Transforming Modern Transportation

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Introduction to Connected Vehicles

Connected Vehicles

Internet-enabled vehicles equipped with advanced sensors and communication modules

- Vehicle-to-Vehicle (V2V)
- Vehicle-to-Infrastructure (V2I)
- Vehicle-to-Pedestrian (V2P)
- Cloud & application connectivity

Telematics Systems

Integration of telecommunications and informatics for intelligent vehicle monitoring

- GPS location tracking
- Engine health diagnostics
- Driver behavior analysis
- Real-time fuel consumption

Impact: Enhancing safety, enabling automation, improving efficiency, and transforming user experience

Why IoT for Connected Vehicles?

Real-Time Monitoring

Continuous data streams enable instant vehicle insights

Enhanced Safety

Collision alerts and lane departure warnings

Predictive Maintenance

Anticipate failures before they occur

Smart Navigation

Live traffic integration for optimal routing

Fleet Optimization

Centralized management and resource allocation

Autonomous Foundation

Building blocks for self-driving vehicles

IoT Architecture for Connected Vehicles

IoT Devices & Sensors

Data collection at the edge

Connectivity Layer

5G, DSRC transmission protocols

Cloud Processing

Scalable data aggregation

Analytics Engine

AI-driven insights generation

Applications

User-facing services & actions

Key IoT Applications

Safety & Collision Prevention

Advanced driver assistance systems (ADAS) with real-time alerts for collision avoidance and emergency response

Smart Navigation

Dynamic route optimization using live traffic data, weather conditions, and predictive algorithms

Telematics Services

Comprehensive diagnostics, fuel monitoring, trip analysis, and performance tracking

Driver Behavior Analytics

Monitoring acceleration, braking patterns, speed compliance for safety scoring

Infotainment Systems

Mobile app integration, voice assistants, and personalized content delivery

Remote Vehicle Control

Lock/unlock, engine start, climate control, and real-time location tracking via smartphone

Data & Analytics in Telematics

Data Collected

- GPS location & speed
- Fuel consumption levels
- OBD-II diagnostics
- Engine temperature
- Tire pressure monitoring
- Driving patterns & events

01

Predictive Maintenance

ML models forecast component failures using historical patterns

02

Driver Scoring

Behavioral analytics generate safety and efficiency ratings

03

Trip Optimization

Route analysis reduces fuel consumption and travel time

04

Accident Detection

AI algorithms identify crash events and trigger emergency protocols

Technologies: AWS IoT Core, Azure IoT Hub, TensorFlow, time-series databases, real-time dashboards

Communication Technologies

DSRC (Dedicated Short-Range Communications)

Low-latency V2V and V2I safety-critical messaging

- 5.9 GHz spectrum
- Range: up to 300 meters
- Ideal for collision warnings

C-V2X (Cellular Vehicle-to-Everything)

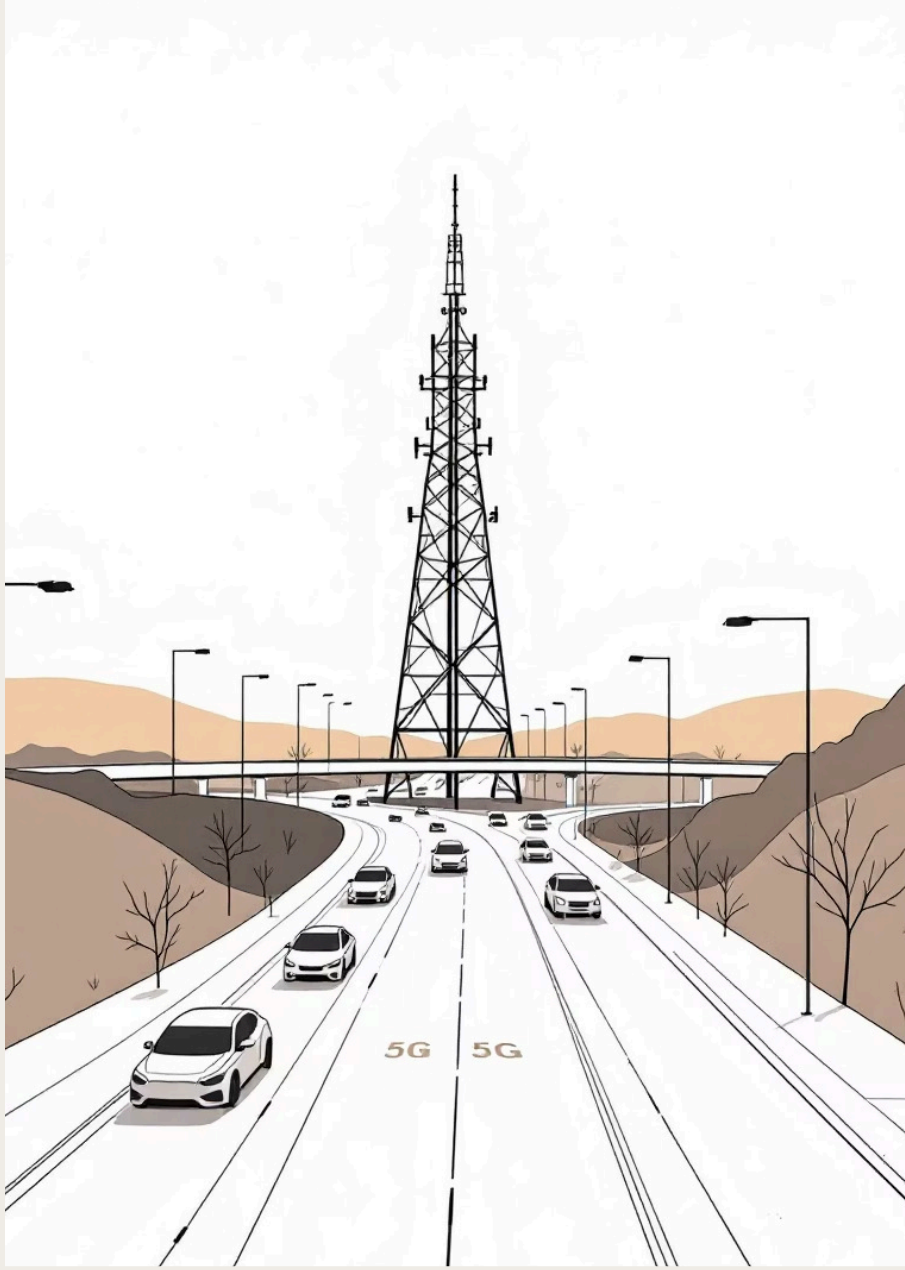
4G/5G-based communication for comprehensive connectivity

- Long-range capability
- High reliability
- Supports autonomous driving

Supporting Technologies

Complementary systems enabling full connectivity

- Wi-Fi & Bluetooth
- GPS/GNSS positioning
- RFID/NFC for tolling



Security & Privacy Challenges

Critical Threats

Vehicle Hacking

Unauthorized access to control systems

GPS Spoofing

False location data injection

Data Theft

Personal information breaches

Remote Attacks

Malicious remote control attempts

Security Solutions

End-to-End Encryption

AES-256 for data transmission protection

Authentication Protocols

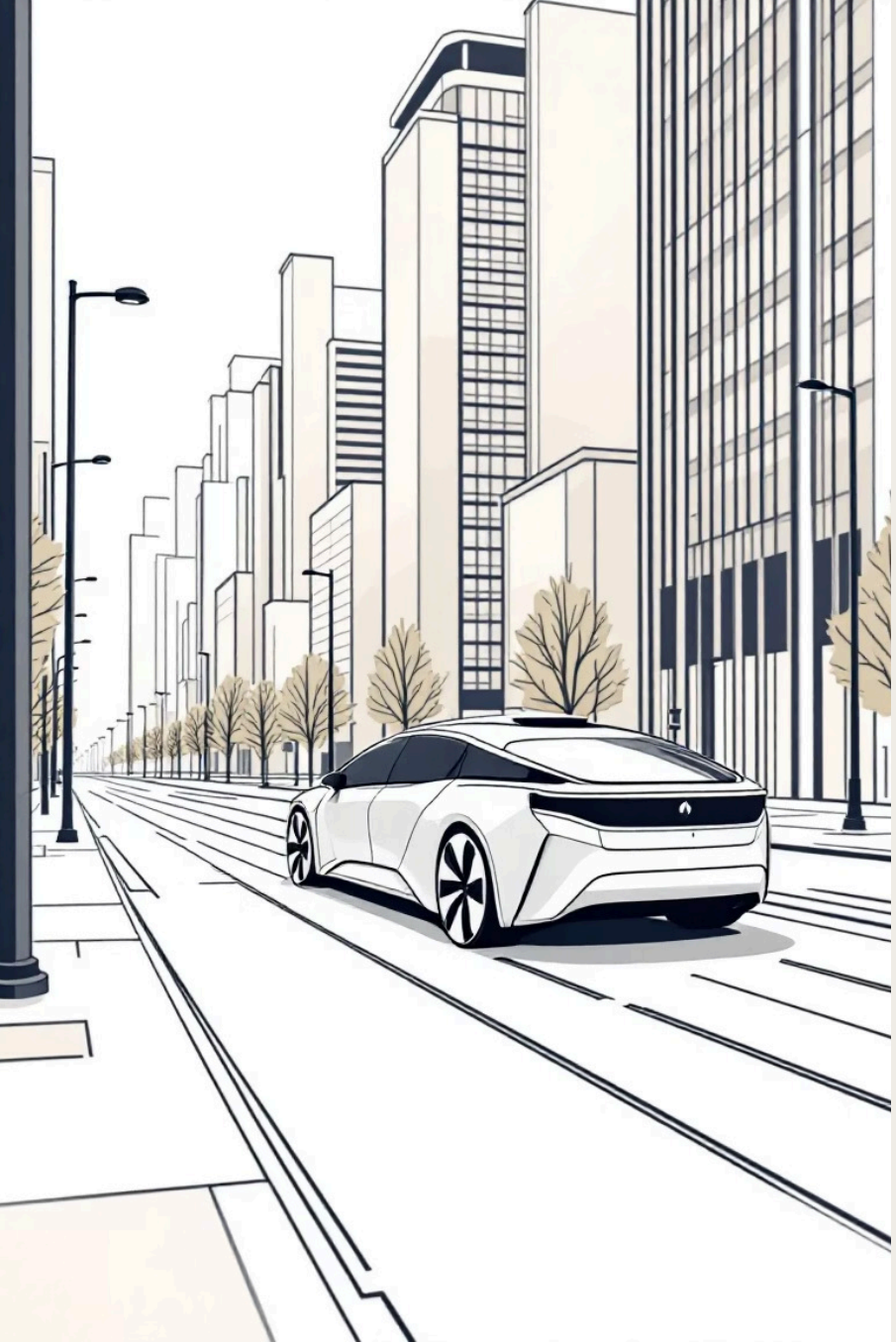
Multi-factor verification and PKI certificates

OTA Updates

Secure over-the-air software patching

Intrusion Detection

Firewalls and anomaly monitoring systems



Conclusion

> **IoT is revolutionizing vehicles into intelligent, connected ecosystems**

Enhanced Safety

Real-time monitoring and collision prevention transform road safety standards

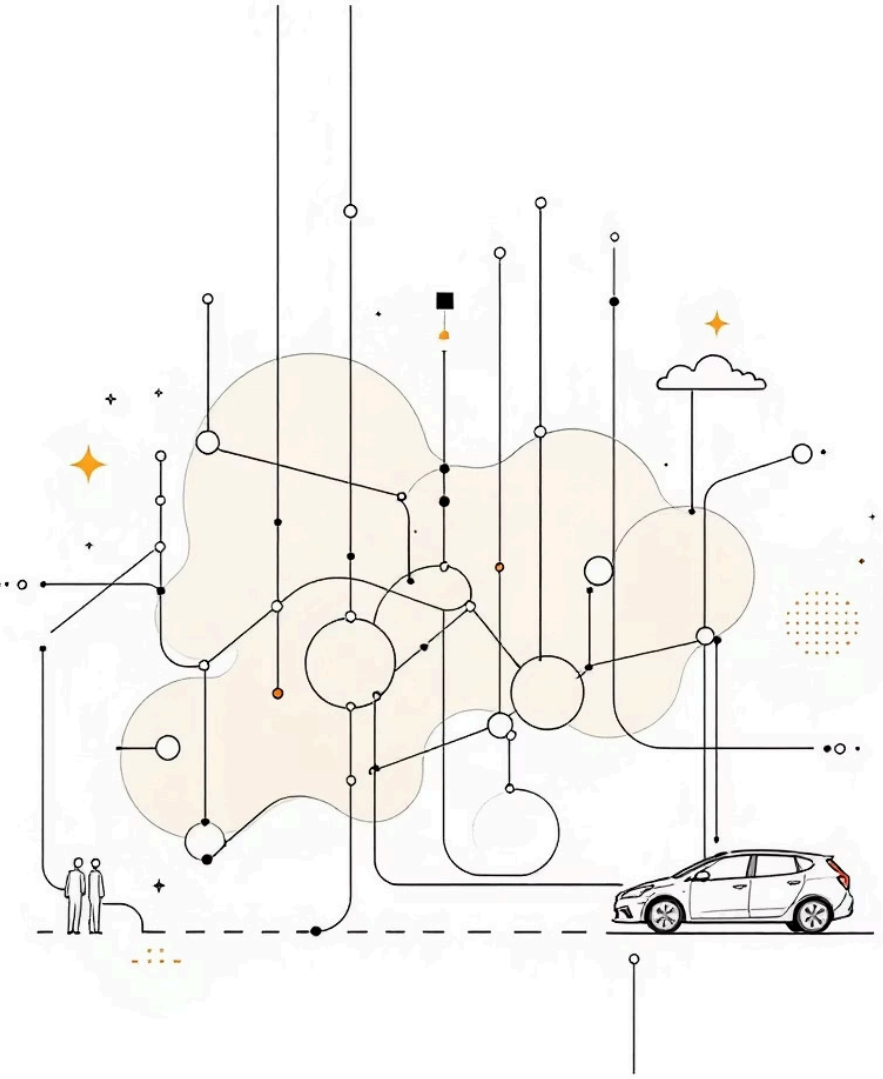
Operational Efficiency

Predictive maintenance and smart routing optimize vehicle performance

Autonomous Future

Foundation for self-driving transportation ecosystems

The Future of Mobility: Connected, data-driven, and powered by IoT innovation



Thank You

Questions & Discussion

IoT Applications: Connected Vehicles & Telematics

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