Revving Up Efficiency
How Automation and C-ITS are Revolutionizing Freight Transport

www.irfnet.ch
Global, Independent, Not-for-profit Organisation established in 1948

Based in Geneva, Switzerland

UN ECOSOC status since 1951

Strategic Pillars of Activities

Knowledge
Connections
Advocacy

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In 2022, post-Covid-19 rebound led to a 3% rise in transport CO2 emissions compared to the prior year.

Transport emissions grew at an average annual rate of 1.7% from 1990 to 2022, outpacing most sectors except industry.

To achieve Net Zero Emissions by 2050, transport sector emissions must decrease by over 3% annually until 2030.
Current Challenges in Freight Transport

- High Dependence on Fossil Fuels
- Inefficient Routing and Traffic Congestion
- Limited Use of Energy-Efficient Tech
- Uneven Vehicle Utilization
The Role of Automation in Freight Transport
The Role of Automation in Freight Transport

Automated Handling and Sorting

Automation is used in freight terminals and warehouses to handle and sort packages and cargo efficiently. Conveyor systems, robotic arms, and sorting machines help streamline the loading and unloading process, reducing manual labor and expediting operations.
The Role of Automation in Freight Transport

Smart Inventory Management

Automation is applied to manage inventory and track shipments throughout the supply chain. Smart sensors and IoT devices monitor stock levels, providing real-time data to optimize inventory management and reduce waste.
The Role of Automation in Freight Transport

Autonomous Trucks and Vehicles

Automation enables the development of self-driving trucks and autonomous vehicles for freight transportation. These vehicles can navigate highways and city streets, making deliveries with reduced human intervention, optimizing routes, and minimizing fuel consumption.
Autonomous Trucks and Vehicles
Fleet Orchestration
Main Benefits of Automation in Energy Efficiency

- Improved Efficiency and Productivity
- Enhanced Safety and Reduced Accidents
- Cost Savings and Sustainability
Cooperative Intelligent Transportation Systems (C-ITS)
What is C-ITS?

"Cooperative Intelligent Transportation Systems are like a big team of cars, trucks, and buses that talk to each other to drive safely and help people get where they want to go.

They use special technology to share important information, like when a car is stopping or turning. This helps everyone on the road know what's happening and avoid bumping into each other.

It's like all the vehicles are friends that work together to make sure everyone has a smooth and happy ride!"
Benefits of C-ITS

- **Traffic flow can be optimised by 10% to 20%.**
- **Fuel consumption can be reduced by 10%.**
- **Early warnings of dangerous traffic situations avoid accidents and improve traffic safety.**
- **Save lives**
- **by prioritising emergency vehicles over regular traffic**
What C-ITS can do …

- Better Traffic Flow
- Better Inform Road Users
- Warn of Hazards
- Identify and Count Vehicles and Measure Traffic
- Reduce Air Pollution and Emissions
- Prioritise Public Transport
- Prioritise Rescue Services

Image by SWARCO
C-ITS communication

**CLOUD COMMUNICATION**
- Communication for road users & connected vehicles
- Real-time traffic data
- SPAT/MAP, CAM

**SHORT RANGE COMMUNICATION**
- Communication for road users & connected vehicles
- Wi-Fi-P, C-V2X
- SPAT/MAP, DENM, CAM, SRM/SSM
## C-ITS standards

### CAM
Cooperative Awareness Messages (CAM) contain information about the vehicles such as type, position, speed (e.g. message from the car).

### DENM
Decentralized Environmental Notification Messages (DENM) contain information about the occurrence of potential dangerous (traffic) situations (e.g. red light violation warning).

### SPAT
Signal Phase And Timing (SPAT) messages contain information on the status of a traffic light controller and its signal groups at an intersection. (e.g. Traffic light is red and will turn to green in 10 seconds)

### MAP
Map Data (MAP) messages contain the exact topology of the intersection. (e.g. location of lanes or stop lines)

### IVI
“In-Vehicle Information” (ISO 19321) regulates the coding of traffic signs, including, for example, dynamic speed limit signage.

### SRM
Signal Request Messages (SRM) are sent by a vehicle to the traffic light to request priority at a signalised intersection. (e.g. request for priority from a bus)

### SSM
Signal Status Messages (SSM) are sent by a traffic light to inform vehicles about the status and activation of previously made prioritisation requests (e.g. acknowledgement of priority to an ambulance)

*European Standardised Messages (ETSI) are used to deliver services that inform, warn and optimise the traffic.
Leveraging C-ITS for Energy Efficiency

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Leveraging C-ITS for Energy Efficiency

Dynamic Speed Limits and warnings

C-ITS can adjust speed limits based on traffic conditions and environmental factors, such as weather or air quality. By adapting speed limits to optimize traffic flow and reduce congestion, energy efficiency is improved.
Leveraging C-ITS for Energy Efficiency

Optimized Traffic Flow

C-ITS allows vehicles to communicate with each other and with traffic infrastructure, enabling the coordination of traffic movements. By optimizing traffic flow and reducing congestion, vehicles spend less time idling or making frequent stops and starts, leading to lower fuel consumption and reduced energy waste.
Leveraging C-ITS for Energy Efficiency

Eco-Driving Assistance

C-ITS can provide real-time feedback and assistance to drivers regarding their driving behaviors. This includes suggestions for eco-driving techniques, such as smooth acceleration, optimal cruising speeds, and early braking.
Leveraging C-ITS for Energy Efficiency

Platooning

C-ITS enables vehicle platooning, where a group of vehicles travels closely together in a convoy, communicating with each other. This reduces air resistance and fuel consumption, especially for long-haul trucks, leading to significant energy savings.

Photo by Bernd Dittrich on Unsplash
Case studies
Case Studies

Port of Los Angeles
Automated Terminal Operations

- One of the world's busiest ports
- Automated Container Terminal: APM Terminals' Pier 400
- Integration of Automation and C-ITS for optimized operations

Photo by Mario Tama / Getty Images
Port of Los Angeles
Automated Terminal Operations

Energy and Cost Savings:
• Energy Savings: Automated Guided Vehicles (AGVs) - Electric and efficient routes
  • Reduced fuel consumption and emissions vs. diesel vehicles
• Labor Costs: Automation reduces manual labor expenses
• Time Efficiency: Continuous operations - Faster ship turnaround, reduced congestion

Relevant Data and Performance:
• Study by NCFRP(*): 30% energy reduction in automated terminals
• APM Terminals: 70% labor cost reduction
• Terminal requires fewer workers for container handling

(*) National Cooperative Freight Research Program (NCFRP)
Case Studies

Platooning Projects in Europe and NA

✓ Trucks equipped with C-ITS for platooning on highways
✓ Close-following formation reduces air resistance
Platooning Projects in Europe and NA

Energy and Cost Savings:
- Energy Savings: Reduced air drag in platoon formation = Lower fuel consumption per mile/km
- Decreased operational expenses for trucking companies

Relevant Data and Performance:
- Daimler Trials: Up to 10% fuel savings for following trucks, 4% for lead truck
- UM-Dearborn and Auburn University trial: three-truck driverless platoon maintained 50m spacing to achieve fuel savings of 12% over 450 hours and 20,000 miles of testing.
- DG MOVE Report: Potential €5,000/year savings per truck
Moving forward

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Challenges and Barriers

- High initial investment costs and infrastructure requirements
- Concerns about job displacement and workforce retraining
- Regulatory and policy challenges in some regions
Overcoming Challenges

- Government Incentives and Subsidies for Early Adopters
- Public-Private Partnerships to Foster Collaboration and Investment
- Developing Comprehensive Policies and Regulations
- Focusing on Reskilling and Upskilling the Workforce
- Promoting Awareness and Information Sharing
IRF’s work on Connected and Autonomous

www.irfnet.ch
IRF Committee
Connected and Autonomous Mobility (CAMC)

www.irfnet.ch/camc/

In collaboration with

European Union Road Federation (ERF)
Association Européenne des Concessionnaires d'Autoroutes et d'Ouvrages à Péage (ASECAP)
Connected and Autonomous Mobility Committee outcomes

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Istanbul, Turkey
Thanks for joining me today!

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