SUPPLY CHAIN MANAGEMENT FOR EFFICIENT CONSUMER RESPONSE CONFERENCE

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VALAHIA UNIVERSITY OF TARGOVISTE, ROMANIA
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REAL-TIME TRAFFIC AND TRAVEL INFORMATION SYSTEMS –

ROLE IN IMPROVING THE SUPPLY CHAIN EFFICIENCY IN METROPOLITAN ENVIRONMENT

Marius MINEA, Maria Claudia SURUGIU
University "Politehnica" of Bucharest

Scope

- *The paper is focusing on the usability and the effects of employing real-time traffic and travel information systems (RTTIS) to help improve the efficiency in such management processes for supply chains.*

- *An analysis is made to estimate the impact in terms of time effectiveness, energy/fuel consumption reduction and a better fleet management.*

- *using RTTIS may improve the productivity associated with the transportation part of the supply chain.*

Operations such as:

- ✓route guidance for supply vehicles,
- ✓route / driver allocation,
- ✓ fuel management and vehicles maintenance can be shaped better to increase the productivity of a commercial company acting in dense urban environment, by beneficiating from a more efficient usage of traffic information.

- The concept of a supply chain, several information components are required:

✓Which is the best route between origin O and destination D?

✓Which of the intermediate points of interest can be included on the route, with an optimization of time and distance consumed?

✓How can the information regarding possible route obstructions, traffic incidents or congestion be included and transmitted in real-time onboard the vehicle?

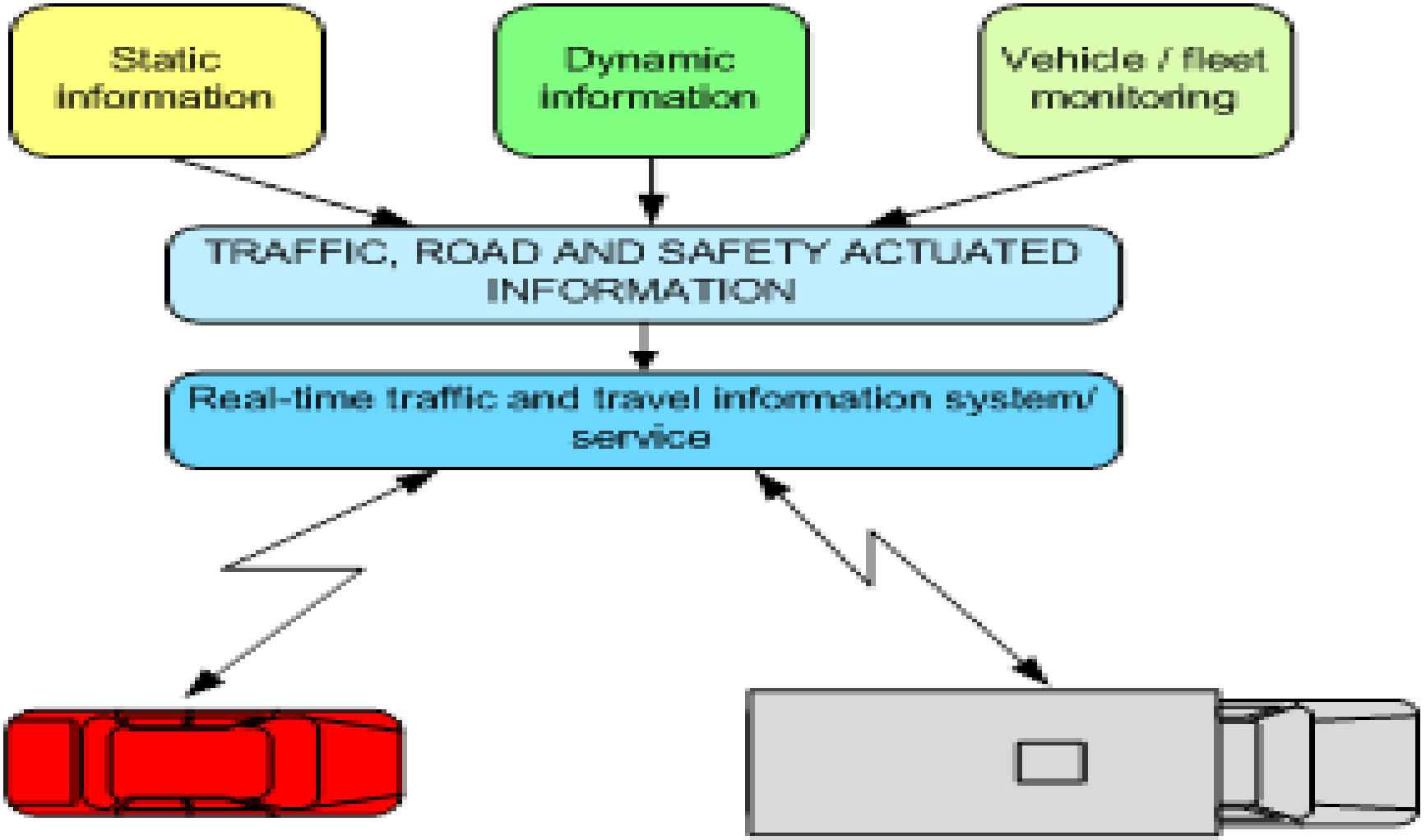

Figure 1 Real-time traffic and travel information concept

- Based on past experiences and current statistics, an estimate energy saving impact of the measures proposed was estimated at:
  - ✓modal shifting away from individual traffic: around 3%;
  - ✓employment of modern traffic management equipment: larger than 50%;
  - ✓improvement of supply chain efficiency: better than 15%.

- By introducing specific information, such systems may be able to induce a specific traffic behavior, beneficial both for supply chain efficiency or environmental impact.

Importance of real-time traffic and travel information in supply chain efficiency and environmental impact

- Road traffic is the less controlled mode of transportation, compared, for example, with the rail traffic.
- Significant economical losses are recorded annually due to traffic congestions, incidents and vehicles' delays.
- At the same time, the proposals hope to dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050.
- Using the Intelligent Transportation Systems (ITS).
- The increasing interest in ITS comes from the problems caused by traffic congestion and a synergy of new information technology for simulation, real-time control, and communications networks.

The concept of the system and services

- The idea of the MRTTI (*Mobile Real-Time Traffic and travel Information*) integrated platform is to collect static/dynamic information from different sources related to traffic and travel, infrastructure, weather and modes of transport, to convert it into a common agreed format, to process the information for efficient management and to deliver it to the final users.

- The “on-trip data” is available via mobile Internet access on PDAs or smart phones with GPS, being able to offer multimodal routing dynamic information, helping the traveller to better manage the route, to avoid congestions, to reduce fuel consumption and thus, emissions.

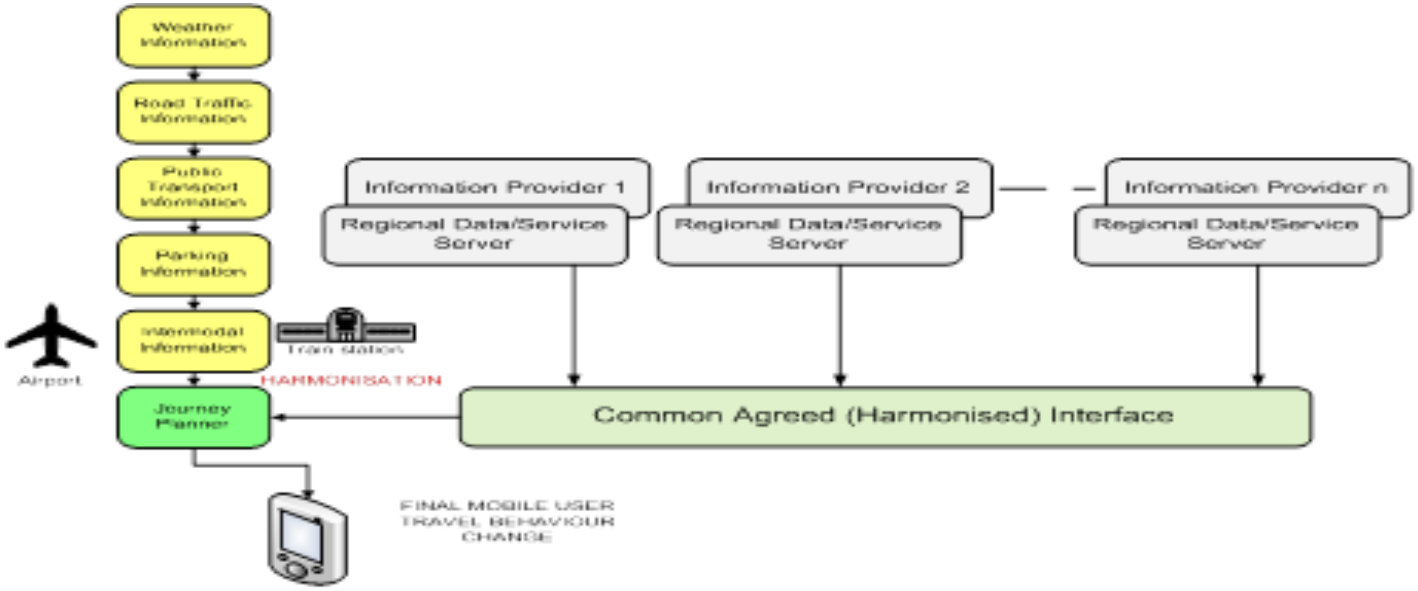

Figure 2 The concept of harmonizing the information formats and interfaces to traffic information services providers

The central part of the service concept is an interoperable and multimodal Regional Data/Service Server (RDSS) which can be seen as a service-oriented middleware infrastructure, providing a number of data/services, covering:

- ✓ individual traffic and travel,
- ✓ public transport,
- ✓ weather,
- ✓ location based services,
- ✓ intermodal transport/trip planning,
- ✓ enabling the operation of the multi-modal real-time travel planning services.

- The goal of this application is to deliver competent and trustful information to the final mobile user, in order to increase the usage of the services, thus influencing the behavior of the travelers and traffic participants in a positive way for the supply chain efficiency and environmental impact.

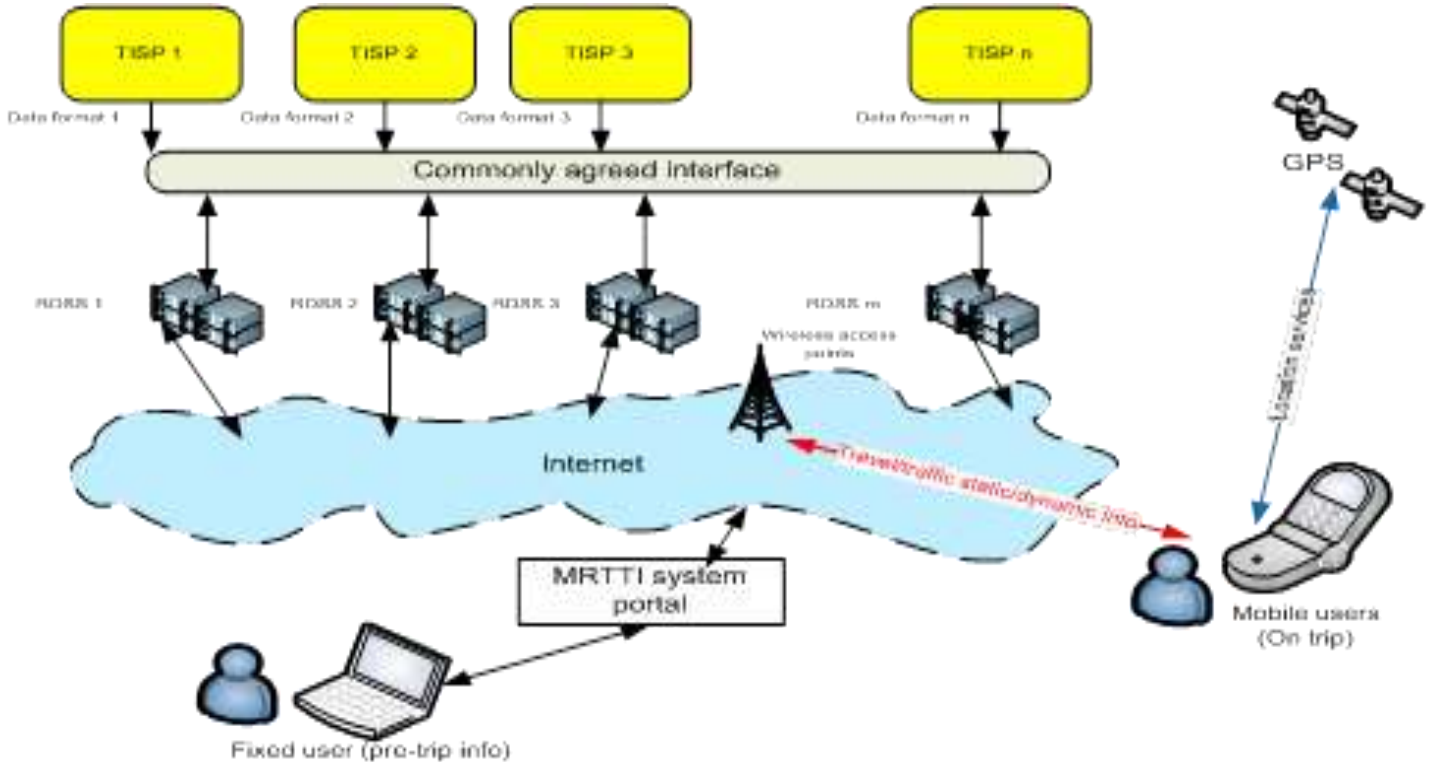

Figure 3 Overall architecture of the MRTTI integrated platform concept

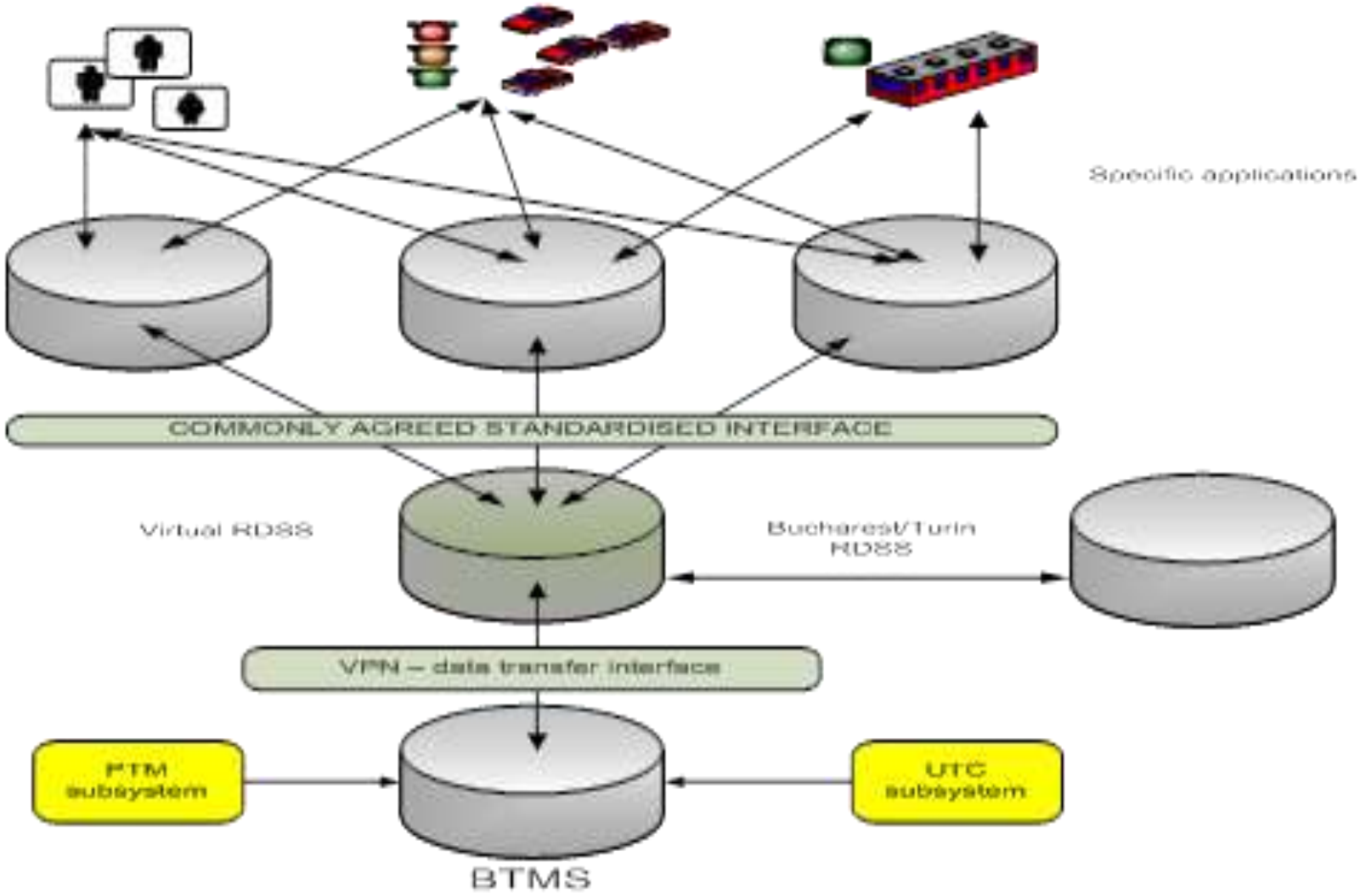

Figure 4 The architecture of a MRTTI system used to improve supply chain efficiency and reduce environmental impact by modal shifting or intelligent routing of freight vehicles

Traffic Congestion Effects on Supply Chains

- Traffic congestion has been defined as "*a condition of traffic delay (i.e.,when traffic flow is slowed below reasonable speeds) because the number of vehicles trying to use a road exceeds the design capacity of the traffic network to handle it*.".
- Transportation impact models treat congestion as a cost factor, comprised of time delay and operating expense.
- Studies supply chain system dynamics modeling were used to show how congestion can change the optimal decisions of manufacturers, distributors and retailers throughout a supply chain.
- Traffic congestion is determined by its composition (Transport distinctive and service vehicles impact the supply chain), during the day and the spatial pattern of congestion, and has effects on intermodal connectivity.

- There are several key reasons for traffic congestion:
  - ✓*Time Periods*;
  - ✓*Spatial Patterns of Congestion;*
  - ✓*Intermodal Linkages.*

$$Do = 1.1\,\mathrm{sqrt}(L * D_r) + 1.8 D_r / C \qquad (1)$$

- The relationship does not greatly depend on depot location.

Conclusion

- Supply chain simulation models based on systems dynamics.
- Congestion impacts can go far beyond mere changes in operating cost.
- The economic impacts of traffic congestion can be greater than expected.
- Many of these additional elements of economic impact take place slowly over time and may not be noticed until their consequences are severe (i.e., entire business operations are rescheduled, reconfigured or relocated), at which time it may be too late to reverse business decisions.