ICT in Transport Logistics Workshop

EURIDICE Project

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EURIDICE Project Coordinator

3-5/11/2008, Lucerne
Contents

• EU scenario and challenges
• EURIDICE approach and vision
• Project structure and objectives
• EURIDICE extended targets
ICT services for goods mobility: EU scenario and challenges

<table>
<thead>
<tr>
<th>Direct employment</th>
<th>Share in total freight transport</th>
<th>Share in total passenger transport</th>
<th>Growth between 1995 and 2004</th>
<th>Expected increase until 2010 (for a transport demand 40% higher than 1998)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road transport</td>
<td>4.3 million (2.6 million in freight transport, 1.7 million in passenger transport)</td>
<td>44%</td>
<td>85%</td>
<td>+ 35% in freight transport, 19% for passenger cars and + 5% for buses and coaches</td>
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<tr>
<td>Rail Transport</td>
<td>1.2 million.</td>
<td>7% (6% for interurban trains, 1% for urban rail (tram and metro).</td>
<td>+ 6% in freight transport (+ 13% in the EU-15, – 9% in the EU-10). + 9% in passenger transport</td>
<td>Same level</td>
</tr>
</tbody>
</table>

Source: EC, DG Enterprise

### Combining all modes of transport
Logistics planning should enable a more balanced use of transport solutions whether unimodal or multimodal.

### Revitalising the railways
Rail transport as key to modal shift for goods transports, needs more flexibility and reliability to attract transport buyers.

### Centralised vs. decentralised logistics
Centralization of stocks in regional hubs, decentralized distribution, quick response, outsourcing to local carriers.

### Efficient and effective Urban Transport
Freight transport to/from and in city areas is an essential element of the quality of life of the 80% of Europe's population.
Meeting the Challenges: ICT for Mobility Strategic Research Agenda

Mobility Services for Goods

- Creating a seamless efficient (goods) mobility service system using ICT as an enabler.
- Exploiting RFID and ICT platforms as critical component and architecture.
- Urban logistics supported by network management.
- High level of liable security and of adequate tracking and tracing.

All of this is technologically possible. Why isn’t it happening already?
EURIDICE intends to fill the **existing gap** between technical feasibility and adoption of ICT services platforms for goods mobility, by coordinating S/T research in two directions:

- Structured approach to technology innovation, harmonizing and filling gaps between existing technologies and aiming at the **intelligent cargo** as unifying concept.

- Holistic perspective on the **business models**, that considers both traditional and innovative logistic models, while looking explicitly at the cargo communities operating at the local and global levels.
**European Inter-Disciplinary Research on Intelligent Cargo for Efficient, Safe and Environment-friendly Logistics**

<table>
<thead>
<tr>
<th>Overall Budget - Funding</th>
<th>14.1 - 8.25 M€</th>
</tr>
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<tbody>
<tr>
<td>Start - End Date</td>
<td>1/2/2008 – 31/1/2011</td>
</tr>
<tr>
<td>Coordinator</td>
<td>Insiel, Italy</td>
</tr>
<tr>
<td>Partners</td>
<td></td>
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</table>
The Intelligent Cargo vision

“In five years time, most of the goods flowing through European freight corridors will be ‘intelligent’, i.e.: self-aware, context-aware and connected through a global telecommunication network to support a wide range of information services for logistic operators, industrial users and public authorities.”
EURIDICE Project Structure and Objectives

P0 Program Management, Coordination, Performance Monitoring

P1 Intelligent Cargo Integration Framework
- Framework Architecture (WP11)
- Domain Knowledge (WP12)
- Cargo Intelligence (WP13)
- Services Authoring, Orchestration (WP14)

Obj 1.1 Network infrastructure for intelligent cargo
Obj 1.2 Fixed and mobile web services infrastructure
Obj 1.3 “On the fly” combination of services for cargo/context interaction
Obj 1.4 Distributed and centralized analysis, prediction and detection
Obj 1.5 Interoperability platform for intelligent cargo users

P2 Pilot Applications
- Industry/Distribution applications (WP23)
- Intermodal transport (WP24)
- Logistic Operators (WP25)
- Authorities and Infrastructures (WP26)

P3 Impact Creation
- Business Modelling (WP31)
- Training (WP32)
- Dissemination and Outreach (WP33)
- Exploitation (WP34)

Obj 2.1 More flexible and efficient supply chains
Obj 2.2 More efficient, transparent and cost-effective intermodal transport
Obj 3.1 Public-private partnership models for intelligent cargo infrastructure
Obj 3.2 More secure and environment friendly transport chains


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EURIDICE extended targets

• EURIDICE vs. ICT industry / ICT research community
  ▪ Include state-of-the-art technologies and standards.
  ▪ Provide prototypes, pilot scenarios and business models to be taken up and developed by industrial ventures.
  ▪ Establish links with complementary initiatives and approaches (ITS, Internet of Things, Vehicle-to-Infrastructure architectures ..).
  ▪ Contribute to road-mapping actions, to stimulate and influence future EU programmes on “ICT mobility services for goods”.

• EURIDICE vs. Transport research community
  ▪ Acquire requirements and new logistic concepts from transportation research.
  ▪ Contribute concepts and technology prototypes to research and pilot projects for the freight transportation sector (Transport research programme, Marco Polo, INTERREG, regional or national initiatives, ..).
EURIDICE extended targets

- Transport companies, Logistic services providers, Logistic users, Authorities, Infrastructures
  - Acquire requirements and feedback on proposed solutions.
  - Provide prototypes, pilot scenarios and business models to be taken up and developed by services providers, authorities and users.
ICT in Transport Logistics Workshop

Intelligent Cargo in the EURIDICE vision

Paolo Paganelli
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EURIDICE Project Coordinator

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Contents

- Intelligent Cargo capabilities
- EURIDICE vision on architectural innovation
- Expected paradigm shift
What does “Intelligent Cargo” mean?

- The **technological innovation** dimension is not sufficient to define Intelligent Cargo.
  
  Smart tags, sensor networks, distributed intelligent agents, ...

- Defining Intelligent Cargo requires a second dimension of **architectural innovation**, to highlight changes from the users perspective.

- EURIDICE initial list of **intelligent cargo capabilities**:

  - Cargo capable of autonomous decisions (intelligent agent),
  - Cargo capable to start processes (independent behavior),
  - Cargo capable to monitor and register its status,
  - Cargo capable to grant access to services (authorization, ETA estimation, data read/write, ..),
  - Cargo capable to detect its context (location, user, infrastructure, ..),
  - Cargo capable to identify itself.
## Intelligent vs. “dumb” cargo, basic capabilities

<table>
<thead>
<tr>
<th>Capability</th>
<th>Dumb Cargo (state of the art)</th>
<th>Intelligent Cargo</th>
</tr>
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</table>
| Self-identification | • Local identification based on proprietary systems of each actor.  
• Shared IDs through ad-hoc connection between back-office systems.  
• Pre-fixed level of detail throughout the supply chain.                                                                                                   | • Global identification provided by public domain services.  
• Cargo is able to self-identify through a common infrastructure, accessible to field users, vehicles and back-office.  
• Dynamically selected level of detail (package, pallet, container, ..).                                                                                   |
| Context detection  | • No self-standing context detection capability.  
• Context is extrapolated by back-office systems accessing other information sources (e.g., local ID repository).                                                                 | • Context determination provided by public domain services.  
• Common infrastructure, providing context data (identification details, location, time) to authorized users.                                               |
| Access to services | • No direct access to services from the cargo itself.  
• Services managed by proprietary systems of each actor or by generic (not cargo related) platforms.                                                                                                               | • Common infrastructure, providing access to services to authorized users or systems interacting with the cargo.                                                                                                  |
## Intelligent vs. “dumb” cargo, specialized capabilities

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<th>Capability</th>
<th>Dumb Cargo (state of the art)</th>
<th>Intelligent Cargo</th>
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<tbody>
<tr>
<td>Status monitoring and registering</td>
<td>• Sensing and data storing at a specific cargo level (e.g. container).</td>
<td>• Status data are available in real time through the service infrastructure.</td>
</tr>
<tr>
<td></td>
<td>• To go beyond raw data, ad hoc back-office elaboration is needed.</td>
<td>• Status data are contextualized and integrated with the other cargo information services.</td>
</tr>
<tr>
<td>Independent behavior</td>
<td>• No such capability.</td>
<td>• Cargo is able to invoke services and start processes autonomously in response to predefined events.</td>
</tr>
<tr>
<td>Autonomous decisions (Intelligent agent)</td>
<td>• No such capability.</td>
<td>• Cargo has decisions making capabilities and is able to choose services to invoke according to circumstances.</td>
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</tbody>
</table>
Architectural innovation approach

- Bring about a paradigm shift by promoting the Intelligent Cargo approach across the widest audience of users.
- There is not an “intelligent cargo” product.
- Different intelligent cargo capabilities require different implementation models:
  - Basic capabilities should be available as public domain services for all the intelligent cargo users.
  - Specialized capabilities should be developed for specific purposes by individual users or groups of users to fulfill specific application requirements.
- There is not a single “intelligent cargo” user:
  - Need to carefully analyze value produced across the transport chain ("Who cares"?).
  - Need a convincing value proposition for all the involved actors.
Who cares about the cargo being intelligent?  
→ Who is the target of our value proposition?

- Strongly interested
- Interested
- Mildly interested
- Neutral
- Hostile

Cargo Owner (Manufacturer, Distributor) 3PL (Logistic Outsourcer) Authority Carrier Terminal Operator Shipping Agent
Example: EURIDICE pilot case (state of the art architecture)

- Local SOA for back-office links.
- RFID on container, handheld reader for field operator at the terminal.
- Batch flow for customs documents.
- Carrier-Terminal systems integration for container identification.

### Before container arrival

- FERCAM system
- Customs Agency
- TMT System

- Send custom document
- Confirm receipt

### Container Clearance

- TMT Operator
- FERCAM System
- Customs Agency

- Container arrives
- Read
- Check container ID
- Retrieve authorization documents
- Check container documents
- Manually done
- Payment request
- Payment OK
- Paper
- Paper

### Containers arriving in the port of Trieste

- TAG
- Handled
- RFID reader
- Field operator

### Shipping agent

- Paper document
- Paper document

### Back-office systems connection

- CUSTOM AGENCY
- 3PL
- Terminal
- Agent

### Terminal operator information system

- GOOD ROUTE
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Example: EURIDICE pilot case
(Intelligent Cargo architecture)

- Same core technologies used in state-of-the-art solution.
- Cargo-initiated, single sequence of activities (vs. batch document flow + on field clearance).
- Back-office links with terminal and customs eliminated.

**Example: EURIDICE pilot case (Intelligent Cargo architecture)**

- **Same core technologies used in state-of-the-art solution.**
- **Cargo-initiated, single sequence of activities** (vs. batch document flow + on field clearance).
- **Back-office links with terminal and customs eliminated.**
## Paradigm shift

<table>
<thead>
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<th>Current paradigm</th>
<th>Intelligent Cargo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data origin</strong></td>
<td>User or back-office generated.</td>
</tr>
<tr>
<td><strong>Interaction paradigm</strong></td>
<td>Organization-to-organization</td>
</tr>
<tr>
<td><strong>Data processing</strong></td>
<td>Centralized at organization level.</td>
</tr>
<tr>
<td><strong>Communication support</strong></td>
<td>Predefined communication channels.</td>
</tr>
<tr>
<td><strong>Data interchange semantics</strong></td>
<td>Mutually agreed with each partner or between trade community members.</td>
</tr>
<tr>
<td><strong>Decisions support</strong></td>
<td>Top-down decision making, based on periodic data revision.</td>
</tr>
</tbody>
</table>
Thing-to-thing vs. organization-to-organization

**Thing-to-thing**
- Connect via cargo objects interaction.
- Decentralized data processing.
- Owner systems may not be involved (only to access owner services).

**Organization-to-organization**
- Connect via pre-existing links between organizations.
- Cargo objects may not be involved (disconnected physical / information flows).
Any-to-any communication and data interchange

- DNS-like system for cargo objects and related services.
- Globally shared semantics.
- On demand configuration of communication resources.
Event-triggered, decentralized decisions support

Intelligent cargo
- Automated event detection and context determination.
- Bottom-up exception resolution (escalation, consolidation of decisions).

Traditional approach
- Data consolidation from back-office systems.
- Top-down centralized monitoring, revision and communication.
Conclusions

- Intelligent Cargo solutions are defined by an innovative architectural approach, **not only by:**
  - Deployment of new advanced technologies,
  - Fulfillment of previously unattainable functional requirements.
- Non-functional requirements make a difference, e.g.:
  - Streamline processes by reversing the paradigm (cargo-centered vs. back-office system centered).
  - Eliminate back-office links (especially those involving uninterested actors).
- Need to pursue innovation along three dimensions:
  - Technological innovation.
  - Value innovation
    - Value chain analysis (who cares, who doesn’t)
    - Value proposition formulation.
  - Business model innovation
    - Ecosystem of involved product and service providers.
    - Viability and sustainability.