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Working Party on Customs Questions
affecting Transport

Informal Ad Hoc Expert Group on the
Computerization of the TIR Procedure
(First session, 19 February 2001,
agenda item 4 (a))

TECHNOLOGICAL APPROACHES AND SOLUTIONS

Electronic documents based on bar-code systems

Example: SmartDocument

Transmitted by TATIS

Attached you will find an informal document, submitted by TATIS Ltd. on the Electronic Confirmation of the Discharge of a TIR Operation.

The TIR System

Electronic Confirmation of the Discharge of a TIR Operation

*A discussion paper on the introduction of bar
coded data transfer*

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1. Introduction

1.1 History

The TIR system was implemented over 40 years ago after the adoption of the TIR Convention by the signatory countries. The system is based on five principles - secure vehicles, international guarantees, the Carnet, mutual recognition of controls by Customs and controlled access to the TIR system - and offers benefits both to business (trade facilitation) and to Customs authorities (security for duty and reduced control requirements). The TIR system has operated successfully since inception. However, the tremendous increase in trade volumes of the 1990's has led to a growing level of infringements within the system. Consequently a new means of controlling the system has to be found, and the Administrative Committee for the TIR Convention adopted a recommendation on 20 October 1995, which calls for electronic confirmation of the discharge of a TIR operation as well as the existing paper based system. The situation is under review and the Recommendation has been amended twice since 1995.

In February 2000, the ninety-fourth session of the Working Party on Customs Questions Affecting Transport of the Economic Commission for Europe (UN/ECE) adopted recommendations for the revision of the TIR Carnet. The Working Party agreed that the revision process of the TIR Carnet should include the "use of new technologies in TIR operations", the strategy, the structures and the electronic platforms to be used still to be identified.

1.2 Using electronic data exchange

As early as 1985, the UN/ECE, realising that "paper-based systems, such as the present TIR Carnet, are a very inefficient medium for data capture and data authentication" came up with the idea of replacing it with an electronic version. Expensive time and resources are needed to process the data that is entered at several different levels and stages of the TIR operation. The biggest loss of time and information occurs at the end of the TIR transaction when the transit is discharged. The inefficiency of the paper-based system reduces Customs' confidence in the process which seriously hampers the central administration and keeps guarantees in place longer than necessary, adding to the cost burden on business and slowing down international trade.

The UN/ECE secretariat, following a decision of the Working Party is investigating more possibilities for the computerisation of the TIR system. One such possibility could be the use of a two-dimensional bar code as a means for data capture, improved data management and control.

Recognising the data transmission and data exchange problems in international trade faced by business and governments, Tatis has developed a technology designed to bridge the gap between a paper-based system such as the TIR Carnet and the digital world of electronic data exchange – this technology is termed the **SmartDocument™**. Recognising the importance of an in-depth understanding of trade and Customs procedures to ensure the technology meets the needs of businesses and Customs authorities world wide, Tatis is working with the global resources of PricewaterhouseCoopers to introduce the technology to as wide an audience as possible.

This paper presents and demonstrates how the combination of the two-dimensional bar code technology developed by Tatis and the implementation skills of PricewaterhouseCoopers can be used to secure a lasting and inexpensive option to control the TIR system.

2. Bar Code Technology – the SmartDocument™

Today, bar codes are globally recognised as a core strategic technology for the identification of items and processing of transactions in almost every industry. Bar codes offer the speed and accuracy that are impossible to achieve using traditional manual techniques. In addition bar codes add virtually no cost to any computer generated paper document and they are rapidly and easily readable by non-specialist personnel. Because of the fundamental simplicity of bar code reading technology and its widespread use, bar code reading systems are broadly available and easily affordable.

In the Customs environment, the difficulties in controlling and recording the movement of goods using traditional paper based methods are well recognised. The loss in revenues resulting from these difficulties (including deliberate fraud) make it essential to consider the use of alternative control systems. The use of bar code based systems is one such alternative that, if utilised, can dramatically cut the incidence of such losses by efficiently identifying and controlling goods in transit, and controlling the processing of other Customs transactions. With the continuing exponential growth in the cross-border movement of goods, fuelled in particular by global electronic commerce, the fundamental need for alternative systems (such as bar code based solutions) to facilitate the efficient control and management of Customs procedures is becoming increasingly important. Manual systems will not cope and today there is no other technology to rival the bar code based technology that can be seamlessly integrated within existing paper-based systems.

SmartDocument™ is the core of Tatis' technology. It is a proprietary web-enabled application, designed to jointly manage and distribute both digital information and secure paper documents. It is a tool that allows the online generation of secure trade documents with an embedded two-dimensional bar code.

SmartDocument™ allows automated data capture using fast, secure, flexible and cost-effective options provided through the scanning of the two-dimensional bar code. The captured data can be displayed in a range of Customs forms and uploaded for storage and future processing into a secure database. This technology is further discussed in **Appendix B**.

Tatis' technology enables multiple layers of managed data access, and information can be made available on a "need to know" basis. Basic information is provided to all users with confidential information compartmentalised and restricted to each higher level of access. For example, higher levels of confidential information (restricted access) may include internal Customs instructions, warnings, risk assessment information, or other confidential information not intended for general use.

3. SmartDocument™ technology and its application to the TIR system

Using SmartDocument™ technology would enable the production of an electronically readable version of the TIR Carnet without replacing the current paper based controls, thus allowing the 'traditional' control to continue until the signatory countries are ready and able to embrace the electronic technology. This would be achieved through the printing of the two-dimensional bar code on the Carnet itself, as illustrated at **Appendix C**. The printed bar code would contain all the information contained on the carnet plus other information applicable to Customs controls that is not for general use. The process would then follow the current system in many respects and the Customs procedures will remain unchanged .

The difference offered by the SmartDocument™ is that it would offer the opportunity to undertake the entire TIR process electronically from issue to discharge where the Contracting Parties involved in the transit have enabled the technology. SmartDocument™ would also provide for the use of electronic transmission of data for any part of the process from application, issue and transit to the discharge of the guarantee and would ensure the security and portability of the data. Paper-based information would remain available whenever required.

3.1 The process

The level of integration of SmartDocument™ technology would govern the actual process. However, as an example, a fictional transit utilising the two-dimensional bar code of SmartDocument™ is illustrated below.

3.1.1 *Application for a carnet* – the application would be made either using the existing system, or through an on-line facility that can be made available utilising SmartDocument™ technology. If an application is made on-line, the carnet can be provided on-line if the issuing association's signature and stamp can be accepted as authenticated when printed electronically.

3.1.2 *Issue of the carnet* – the application would be processed using the current system to ensure only authorised operators are issued with a carnet. The carnet would be printed using SmartDocument™ technology to incorporate the two-dimensional bar code. If applied on-line, the carnet would be printed out at the applicant's premises after security checks such as PIN authentication. Printing the carnet would activate the guarantee and create an electronic record of the transit application.

3.1.3 *Commencing the transit* - where the country of departure is SmartDocument™ enabled, the relevant authority will read the two-dimensional bar code using a simple hand held scanner, or other method as outlined at section 3.3 below. The scanning will update electronically the central transit record for the consignment, and update any Customs system concerned in the country of departure. Where SmartDocument™ is not enabled in the country of departure the current paper control procedure will be followed.

3.1.4 *Recording the transit at entry into the transit countries* - in each country of transit, the carnet is presented to the Customs at entry as it is now. Where the country of transit is not SmartDocument™ enabled the information is recorded manually (or by using an unrelated computer system) in accordance with the current system. If SmartDocument™ has been enabled, all the required information is taken from the bar code by scanning with an inexpensive bar code reader, and the information automatically updates the transit country's database.

Recording the transit at exit from the transit countries - in each country of transit, the carnet is presented to the Customs at exit as it is now. Where the country of transit is not SmartDocument™ enabled the information is recorded manually (or by using an unrelated computer system) in accordance with the current system. If SmartDocument™ has been enabled, all the required information is taken from the bar code by scanning with an inexpensive bar code reader, and the information automatically updates the transit country's database. This completes the country transaction, with immediate discharge and no danger of mis-keying or lost documents as the discharge is done electronically.

3.1.6 *Controlling the transit domestically* - parameters may be set by Customs within the SmartDocument™ system to give timely warning of excessive transit times or to highlight sensitive or high duty goods for enhanced control. Should the SmartDocument™ system be only partially implemented in the country of transit, e.g. enabled at entry but not at exit, then the current manual system will be used at the non-enabled point to reconcile the transit until such time as the country is fully enabled at all transit points to gain maximum efficiency from the system.

3.1.7 *Completing the TIR transaction* – each transit country may inform the central point (that monitors the transit transaction to completion) of the commencement and completion of the transit transaction in that country. The country of final destination will submit the paper carnet to the central point. Where the SmartDocument™ has been enabled the completion of the transit may be notified electronically thus enabling electronic discharge of the carnet.

3.1.8 *Central monitoring* - each country reading the data electronically using SmartDocument™ can transmit the data required to the central point monitoring the transit. The additional advantage is that the uncertainty of a failed transit is reduced and finally eliminated as the electronic tracking has a real time quality that cannot be matched by the paper based controls. The failure point can be accurately identified and the country of diversion may take action to secure any duty liability as each country of transit can use the data to monitor the guarantee.

3.2 Advantages of the use of SmartDocument™

The introduction of Tatis SmartDocument™ technology will bring to the TIR system the benefits of:

- More efficient data capture – eliminating the need for manual Customs entry
- Better document handling
- Reduction in the opportunities for fraud
- Fast and efficient guarantee management
- The ability to generate up-to-date trade statistics

- Trade facilitation and reduced business costs
- The ability to build in risk assessment capabilities

The advantages of the Tatis technology over alternatives, such as introducing Smartcards or full EDI implementation, are that:

- The technology can be implemented to run in parallel with the existing paper based system thus allowing implementation by contracting parties when they are ready, without disrupting the TIR system.
- The technology is easy to install and inexpensive to operate by the Customs authorities and approved operators; no special software is required and the Internet supports the technology.
- The system is easy to understand, building as it does on the existing TIR procedures, thus minimising disruption and training requirements.
- Data reconciliation can be through a central unit as at present with vastly improved procedure throughput times whilst individual Customs authorities can access up-to-the-minute data concerning TIR consignments both in their country and neighbouring countries (where required and permitted).
- The technology allows Customs authorities to control non-TIR transits utilising the same system so cutting control costs for both businesses and Customs.
- The technology will interface with existing Customs computer systems where required.

3.3 SmartDocument™: a flexible tool

The greatest advantage of SmartDocument™ is its flexibility of implementation. The level of computerisation of Customs administrations varies greatly amongst the members of the TIR convention, from advanced EDI infrastructures to no infrastructure at all. Tatis' technology could be deployed all over the world in both computerised and non-computerised fiscal administrations.

Depending on the take up of an electronic infrastructure, a number of methods of tracking transits are possible, some of which are illustrated below:

3.3.1 System with a WAN/LAN or Dial-up connection – Where the computers in Customs offices are connected together in a network either locally (Local Area Network or LAN) or nationally (Wide Area Network or WAN) Customs may verify the SmartDocument™ via a computer with a connection. The secure symbol of the SmartDocument™ may be scanned and checked, and data may be uploaded automatically to the Guarantee Management central database. In the event that there is no permanent connection to the Internet at the border point, verification of the authenticity of the SmartDocument™ can be performed off-line. The reconciliation itself – log management – can be done periodically by connecting over the telephone system via a dial-up connection.

3.3.2 *System using wireless devices* - Customs might also verify the SmartDocument™ via a wireless device such as a pager, a mobile phone or a personal digital assistant. SmartDocument™ technology introduces data capture and communication technologies into existing information systems. It allows end users to personalise the services that they want to access from their mobile device.

3.3.3 *Fax-back system or voice recognition system* - Verification of the SmartDocument™ can be performed via a fax-back system or a simple voice recognition system. The Customs officer can dial a given number on his fax machine and, in a matter of seconds, receive a copy of the required SmartDocument™ and its status (log file). The Customs officer will also be able to call a voice recognition system and confirm data over the phone.

4. Conclusion

In conclusion, using SmartDocument™ technology allows rapid and accurate data capture. It reduces or eliminates the need for manual data processing by Customs as transaction specific information will have been entered at the earlier stages of the transaction. As a more efficient data capture system SmartDocument™ creates a better document handling system by increasing security as well as facilitating the transit operation.

As the data capture is electronic and immediate, guarantee management can be improved, and SmartDocument™ technology provides the opportunity for the rapid discharge of the carnet.

In addition to these benefits, as pointed out earlier, SmartDocument™ technology is flexible. It can be used in highly developed and computerised countries as well as in those that are less automated. The implementation of a SmartDocument™ system will not require any major change in the current TIR procedures. The TIR process may remain paper-based where no wired connection is available. Equally, it may be fully automated where the fiscal administration is supported by an appropriate digital infrastructure.

Should the TIR secretariat wish to open a dialogue to analyse how Tatis SmartDocument™ technology could be utilised, including the possibility of implementing a pilot project, contact details are given in **Appendix D**.

Appendix A – A profile of Tatis S.A. and PricewaterhouseCoopers

Tatis S.A.

Tatis S.A. has been formed to provide innovative solutions to the problems facing Governments where exercising effective control over internationally traded goods is hampered by ineffectual control systems. Tatis has developed a range of trade facilitation and revenue compliance solutions designed to strengthen transparency and accountability in response to the needs of Governments, that have been identified by PricewaterhouseCoopers when implementing organisational and procedural improvements in Fiscal Authorities for Governments worldwide. SmartFiscal.com, the Tatis e-Customs portal, addresses the key needs of Fiscal Authorities in terms of revenue compliance, trade facilitation and good governance. SmartFiscal™ products are the first to offer integrated revenue compliance and trade facilitation benefits that go "hand in hand" rather than implying a trade-off. The design of the SmartFiscal™ applications facilitates implementation in a customised modular fashion. The client's specific requirements are implemented to a specific configuration. The key elements in SmartFiscal™ implementation are information integrity, data access management, security, tracking and audit functions.

Fiscal Information Management is one of the key needs of governments worldwide. The SmartFiscal™ suite of products directly addresses the Fiscal Information Management needs of these clients via the SmartDocument™ technology (www.smartdocument.com). SmartDocument™ forms the core of information management solutions, ensuring rapid and accurate processing of data required in trade and fiscal transactions, with audit and oversight functions being addressed with the addition of a tracking capability. SmartDocument™ information management solutions ensure data integrity and bridge the gap between paper and electronic trade and fiscal transactions while providing direct cost savings, revenue compliance and trade facilitation benefits to our clients.

PricewaterhouseCoopers

PricewaterhouseCoopers (PwC) is a professional services organisation employing approximately 155,000 staff. The firm operates in 150 countries through 867 offices. The extensive range of services provided by PwC includes taxation administration reform, legal services, management consultancy, audit, financial accounting, corporate finance and due diligence. PwC is an integrated, global organisation with a consistent philosophy and approach to business around the world. This structure combines responsiveness to the national and local environment with a world wide capacity to provide consistent standards of excellent service. As such, PwC has extensive access to resources and expertise, creating a critical mass that enables PwC to:

- transfer knowledge, skills and technologies rapidly and flexibly
- have well resourced offices in key centres
- provide local delivery of integrated services and internationally consistent standards

The Overseas Revenue Consulting group (ORC), based in the PwC London offices, is a team of specialists who advise governments and tax administrations on tax reform and administration issues and assists governments to restructure their revenue and tax systems and legal frameworks. ORC draws together expertise in tax technical and policy matters, information technology, human resources, financial issues, management, and change management practices to produce sustainable change. Utilising the extensive experience within ORC of organising and co-ordinating large scale tax reform projects, PwC would provide the core competencies necessary to achieve the changes required for successful implementation of the Tatis systems.

Appendix B – technical issues in the choice of bar code systems

Traditional linear (1D) bar codes essentially act as a key to an external database that contains the real information that is necessary for the processing of logistical transactions. In general this application scheme works extremely well and it is for this reason that linear bar code-based systems have been adopted and implemented on such a widespread global basis. In recent years, however, there has been an increasingly broad recognition of key application needs beyond the capability of traditional 1D bar codes. In all of these applications there are two prime requirements: the ability to store more data; and the requirement for higher levels of security.

The requirement to store more data predominantly derives from the recognition that although ubiquitous real time access to EDI transaction data remains the preferred solution and the ultimate goal, in practice this is not wholly achievable at present or in the foreseeable future. Physical goods frequently move faster than the transaction data. Smaller organisations do not have the infrastructure to support EDI and even in larger organisations, real time EDI access is not available at all locations where it is needed for the processing of transactions.

For all of these reasons a solution is required that offered all of the established benefits of traditional 1D bar code technology, including its inherent compatibility with existing paper-based systems, but with the ability to store larger volumes of data. The minimum requirement is to store the key transaction data that is required to process, accurately and securely, the physical flow of goods in an off-line manner thus eliminating delays and bottlenecks in the overall logistical process. In essence, the requirement is for a high capacity bar code that could travel with the goods, acting as a 'Portable Data File', that contains an efficiently structured subset of an EDI logistics message.

For these compelling 'real world' reasons, key industry organisations are today finalising the development of the necessary standards. All of these emerging standards employ at their core a two-dimensional (2D) bar code technology known as PDF417.

PDF417 is published as a CEN technology standard (ENV 12925) and it is also in final draft as an ISO technology standard (ISO/IEC 15438). Additionally, PDF417 is specified for shipping, receiving and EDI applications within a new ISO transport label standard (ISO/DIS 15394) also currently in final draft.



Sample PDF417 Symbol

PDF417 has also been selected as the 2D technology foundation for a new '**Composite Symbology**' developed for **UCC/EAN**. For Logistics applications it is combining the ubiquitous EAN 128 and a special UCC/EAN versions of PDF417 in a single bar code symbol. Amongst other application needs, this new Composite Symbology is intended to address the critical requirement for additional transaction data to travel with the goods in bar code format so as to facilitate the instant off-line processing of logistical transactions where EDI information is not available.

The EAN 128 component of the symbol provides access to the EDI information where this is available, in parallel protecting the large existing installed base of EAN 128 based reading systems. The composite (2D) component provides an efficient and reliable solution for those who wish to benefit from the off-line transaction processing capabilities which the Composite Symbology supports. It is anticipated that as a result of the power and benefits of the new Composite Symbology, it will be implemented rapidly and broadly throughout the retail logistics environment and beyond.

For similar reasons, PDF417 is also being rapidly adopted and implemented by other major industry groups and standards organisations. PDF417 will be deployed as part of a new transport label standard currently under development by the European automotive industry. It has also been adopted by various commercial freight carriers and forwarders, including TNT, UPS, Kuehne & Nagel, Schenker, ASG and many more. PDF417 has also been selected by La Poste in France as a strategic technology for use in parcel and recorded delivery postal applications. For similar reasons it is currently under evaluation by a number of other major European postal administrations.

In summary, both for the efficient off-line processing of customs transactions and for the secure, fraud resistant transfer of value-critical information, it is clear that PDF417 provides the ideal solution – standardised by CEN and already adopted by leading industries and organisations throughout Europe for supply chain and logistics applications.

Overall, to provide an optimal solution to the requirement for transit and other customs applications needs, it is recommended that a hybrid solution be employed utilising the new UCC/EAN Composite Symbology and specifically the variant based on EAN128 and 'Composite Component C' – full capacity PDF417. In terms of data structure, EAN standards would be relevant, potentially augmented by agreement with EAN, to incorporate encrypted data within the PDF417 symbol so as to provide an additional high security layer to protect value-sensitive customs data and in parallel to help authenticate the document itself.

Beyond the benefits of harmonisation with UCC/EAN – the world's largest bar code-based open system – from a 2D technology standpoint this approach is also consistent and harmonious with the strategic directions of other key European industries and organisations, including the leaders in the postal, parcel and freight service environments.


Finally, this Composite 1D/2D approach will allow those organisations and locations with assured database access to make use of any installed 1D bar code-based systems whilst elsewhere full Composite reading capability can be implemented from the outset. It is perhaps important to emphasise that because of the high levels of demand created by UCC/EAN standardisation, Composite Symbology reading systems will soon cost little more than traditional 1D bar code-based solutions. For this reason, both for 1D and for 2D requirements, it is anticipated that in the future, the vast majority of bar code reading systems purchased for use in logistics applications will be fully PDF417/Composite capable.



Sample EAN composite code

The major potential benefits of PDF417 described in this document are already clearly understood by specialist organisations such as Tatis, the leading innovator in e-fiscal Business to Government (B2G) portal solutions.

Appendix C – Illustration of the SmartCarnet™ design

<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;"> Name of International Organisation </div> <h2 style="margin: 0;">SmartTIRCarnet</h2>	
<p>Route: Berlin- Kiev</p>	 XB25000000
<p>1. Valable pour prise en charge par le bureau de douane de départ jusqu'au 10.12.2001 inclus <i>Valid for the acceptance of goods by the Customs office of departure up to and including</i></p>	
<p>2. Délivré par XXX <i>Issued by</i> <small>(nom de l'association émettrice / name of issuing association)</small></p>	
<p>3. Titulaire XXX <i>Holder</i> <small>(nom, adresse, pays / name, address, country)</small></p>	
<p>4. Signature du délégué de l'association émettrice et cachet de cette association: <i>Signature of authorized official of the issuing association and stamp of that association:</i></p> <div style="border: 1px dashed black; border-radius: 50%; width: 80px; height: 80px; margin: 10px auto;"></div>	<p>5. Signature du secrétaire de l'organisation internationale: <i>Signature of the secretary of the international organisation:</i></p> <div style="border: 1px solid black; width: 100px; height: 40px; margin: 10px auto; text-align: center; line-height: 40px;"> XXX </div>
<small>(A remplir avant l'utilisation par le titulaire du carnet / To be completed before use by the holder of the carnet)</small>	
<p>6. Pays de départ Allemagne / Germany <i>Country/Countries of departure</i></p>	
<p>7. Pays de destination Ukraine / Ukraina <i>Country/Countries of destination</i></p>	
<p>8. No d'immatriculation du véhicule routier DE 256849 <i>Registration No. of road vehicle</i></p>	
<p>9. Certificat d'agrément du véhicule routier (No et date) DL 360 / 08.1999 <i>Certificate of approval of road vehicle (No. and date)</i></p>	
<p>10. No d'identification du conteneur ZPL 56489 <i>Identification No. of container</i></p>	
<p>11. Observations diverses XXX <i>Remarks</i></p>	
<p>12. Signature du titulaire du carnet: <i>Signature of the carnet holder:</i></p>	

Appendix D – Contact details

Tatis SA

Marc-Henri Veyrassat, Chief Executive Officer

Tatis SA

69d, Rue de Lausanne

CH-1202 Geneva

Switzerland

Telephone: +4122 908 55 20

Frédéric de Senarclens, Vice President, Business Development

Tatis SA

69d, Rue de Lausanne

CH-1202 Geneva

Switzerland

Telephone: +4122 908 55 16

PricewaterhouseCoopers

Stephen Tye, Group Manager

Overseas Revenue Consulting Group

PricewaterhouseCoopers

1, Embankment Place

London

WC2N 6NN

UK

Telephone: +44 207 213 2823

Peter Lindsay, Senior Manager

Overseas Revenue Consulting Group

PricewaterhouseCoopers

1, Embankment Place

London

WC2N 6NN

UK

Telephone: +44 207 212 2254