BTFS: The Border Trade Facilitation system†

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System Description:

We will demonstrate the Border Trade Facilitation System (BTFS), an agent-based bilingual ecommerce system built to expedite the regulation, control, and execution of commercial trans-border shipments during the delivery phase. The system was built to serve *maquila* industries at the US/Mexican border. The BTFS uses foundation technology developed here at Sandia Laboratories' Advanced Information Systems Lab (AISL), including a distributed object substrate, a general-purpose agent development framework, dynamically generated agent-human interaction via the World-Wide Web, and a collaborative agent architecture. This technology is also the substrate for the Multi-Agent Simulation Management System (MASMAS) proposed for demonstration at this conference. The BTFS executes authenticated transactions among agents performing open trading over the Internet. With the BTFS in place, one could conduct secure international transactions from any site with an Internet connection and a web browser. The BTFS is currently being evaluated for commercialization.

In 1997 the AISL completed a prototype of the Border Trade Facilitation System (BTFS), a collaborative information processing environment that operates on the Internet and World-Wide Web. The BTFS comprises multiple autonomous software agents that assist human actors in conducting international shipping transactions by creating, documenting, monitoring, and coordinating shipment transactions in information space.

The BTFS prototype demonstrates a multi-agent approach to coordinating a complex, knowledge-intensive shipping process. We have demonstrated the following agent behaviors: elicitation, mediation between ontologies, negotiation, delegation, monitoring, goal satisfaction, and conduct of an authenticated negotiation protocol for commercial contracts. A typical trans-border documentation package includes one to two dozen Spanish and English forms. The BTFS allows a registered user to fill out the core documentation set and execute the border crossing paperwork.

The essential concept of the BTFS is that the physical trans-border shipment of goods and the required accompanying certification are entirely represented as a set of events in information space, the state of which both controls and certifies events in physical space. The BTFS information system contains a real-time transaction-centric model of the physical border-crossing process. The BTFS design is based on

† This work was performed at Sandia National Laboratories, which is supported by the U.S. Department of Energy under contract DE-AC04-94AL85000

three general concepts: (1) creation of a distributed object programming environment with an underlying secure network infrastructure; (2) a distributed object representation of a shipping transaction; and (3) insertion of knowledgable software agents at critical points in the information flow.

The BTFS is supported by the AISL's distributed object programming system DCLOS (Distributed CLOS) that provides a seamless design methodology for networked object environments. DCLOS is essential to networking agents in a collaborative environment. DCLOS also supports a shared fragmented workpiece object. The information needed to effect a single shipment is captured in a complex distributed information structure with compositional semantics called the Maquila Enterprise Transaction (MET). The components of a given MET are distributed among the agencies involved in a particular shipment; no one agent or agency has access to all components. The MET is shared via proxy; when a given agent needs MET information, it is handed a MET proxy. Access is permitted based on task requirements and controlled by electronic signature. BTFS agents interact with the border-crossing process by collecting and organizing information and posting it in the MET. Control of the distributed computation is decentralized and opportunistic. Each agent computes new information components based on its internal knowledge base and the state of the MET . Changes in the components trigger computations in a manner reminiscent of blackboard systems

The framework comprises two associated abstract classes: *agent* and *agency*. An *agency* identifies an independent locus of processes, activities, and knowledge typically associated with some natural partitioning of the application domain. Agencies are collectives of agents that have ongoing high-level goals stated in business terms. In particular, the BTFS is a distributed set of agencies specialized on the commercial functions of the various stakeholders in the border-crossing process. The underlying assumption is that the application is naturally modeled as a group of interacting agencies, certainly true for the BTFS.

An *electronic commerce agency* (ECA) is a specialized subclass of the agencies class that implements architectural features specific to ecommerce applications. An ECA has the additional attributes of *transactions* and *organizations*. The transactions attribute holds a collection of open and closed transaction objects. The organizations attribute holds a collection of public proxy objects pointing to agencies that represent trading partners.

The BTFS agent society comprises several federated ECAs analogous to the interested business entities. Each ECA is populated by a heterogeneous collective of speciated agents, each of which is able to perform a fragment of the information tasks needed to effect trans-border shipment. Their exact duties are based on the idiosyncratic business rules of the actual businesses involved, so an operational ECA must be tailored and situated for each business. Constructing the ECA and the agents that make it up consists in specializing agents from a set of standard agent classes constructed for commerce. ECA classes are also pre-defined for the various required roles: originator, receiver, transport provider, and import/export broker.

The submission

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Submitted for Demonstration:
The Border Trade Facilitation System (BTFS)

System Description:

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Hardware requirements:

A large (your choice, I recommend at least 17 inch) multisync monitor

Border Trade Facilitation System (BTFS) Storyboard

1. Sign on to BTFS; opening screen
2. Initiate transaction for shipment
3. Contact transport firm; arrange for transportation
4. Fill out required forms (a)
5. Fill out required forms (b)
6. Initiate verified transaction; inspect open transactions

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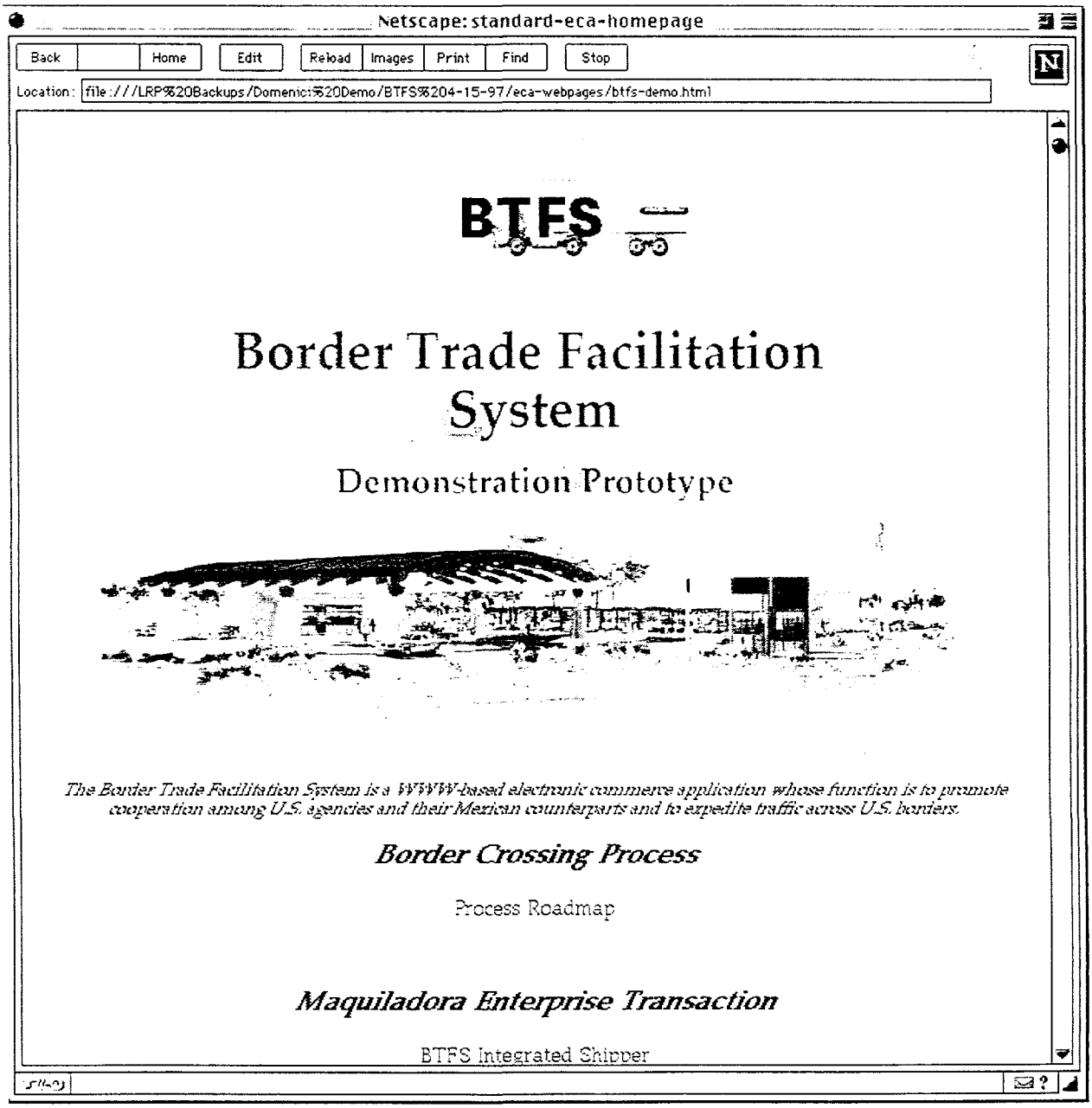
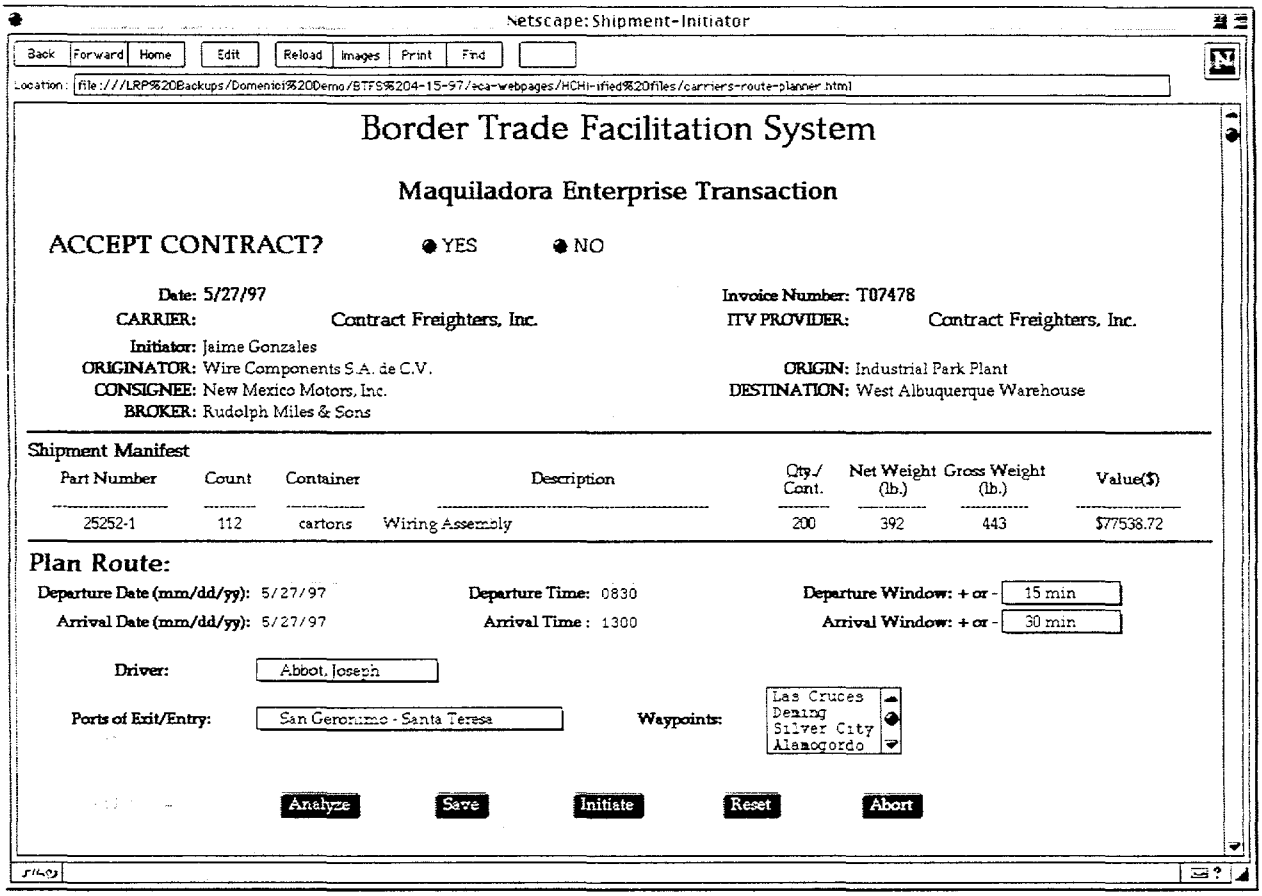
1. Sign on to BTFS; opening screen



2. Initiate transaction for shipment



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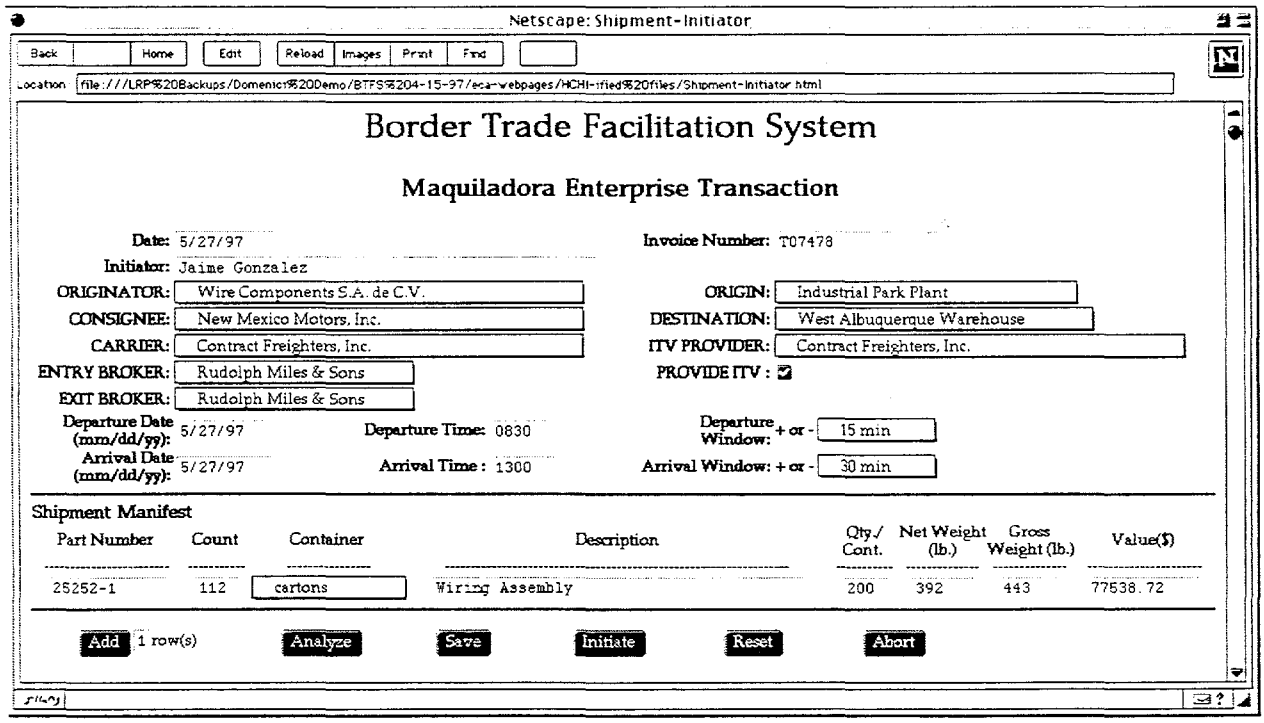
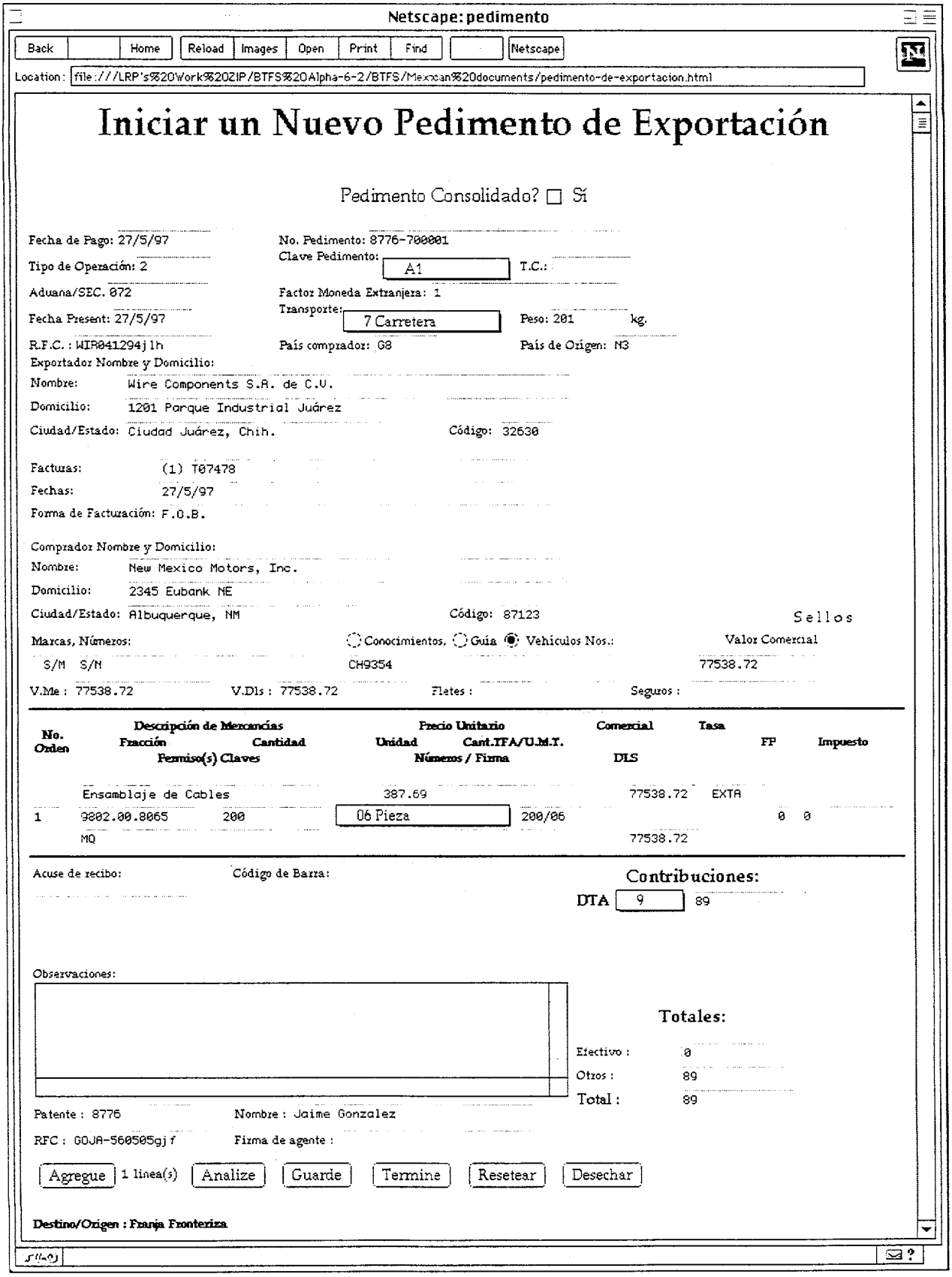


4. Fill out required forms (a)



Netscape: pedimento

Back | Home | Reload | Images | Open | Print | Find | Netscape

Location: file:///LRP's%20Work%20ZIP/BTFS%20Alpha-6-2/BTFS/Mexican%20documents/pedimento-de-exportacion.html

Iniciar un Nuevo Pedimento de Exportación

Pedimento Consolidado? ☐ Sí

Fecha de Pago: 27/5/97
No. Pedimento: 8776-700001
Tipo de Operación: 2
Clave Pedimento: A1
T.C.:
Aduana/SEC. 072
Factor Moneda Extranjera: 1
Fecha Present: 27/5/97
Transporte: 7 Carretera
Peso: 201 kg.
R.F.C.: WIR041294jlh
País comprador: G8
País de Origen: N3

Exportador Nombre y Domicilio:

Nombre: Wire Components S.A. de C.V.
Domicilio: 1201 Parque Industrial Juárez
Ciudad/Estado: Ciudad Juárez, Chih.
Código: 32630

Facturas: (1) T07478
Fechas: 27/5/97
Forma de Facturación: F.O.B.

Comprador Nombre y Domicilio:

Nombre: New Mexico Motors, Inc.
Domicilio: 2345 Eubank NE
Ciudad/Estado: Albuquerque, NM
Código: 87123

Sellos

Marcas, Números: ◌ Conocimientos, ◌ Guía ◉ Vehiculos Nos.: Valor Comercial

S/M S/N | CH9354 | 77538.72

V.Me: 77538.72 V.Dls: 77538.72 Fletes: Seguros:

No. Orden	Descripción de Mercancías / Fracción / Permiso(s) Claves	Cantidad	Precio Unitario / Unidad / Cant.TFA/U.M.T. / Números / Firma	Comercial DLS	Tasa	FP	Impuesto
	Ensamblaje de Cables		387.69	77538.72	EXTA		
1	9802.00.8065	200	06 Pieza 200/06			0	0
	MQ			77538.72			

Acuse de recibo:
Código de Barra:

Contribuciones:
DTA 9 89

Observaciones:

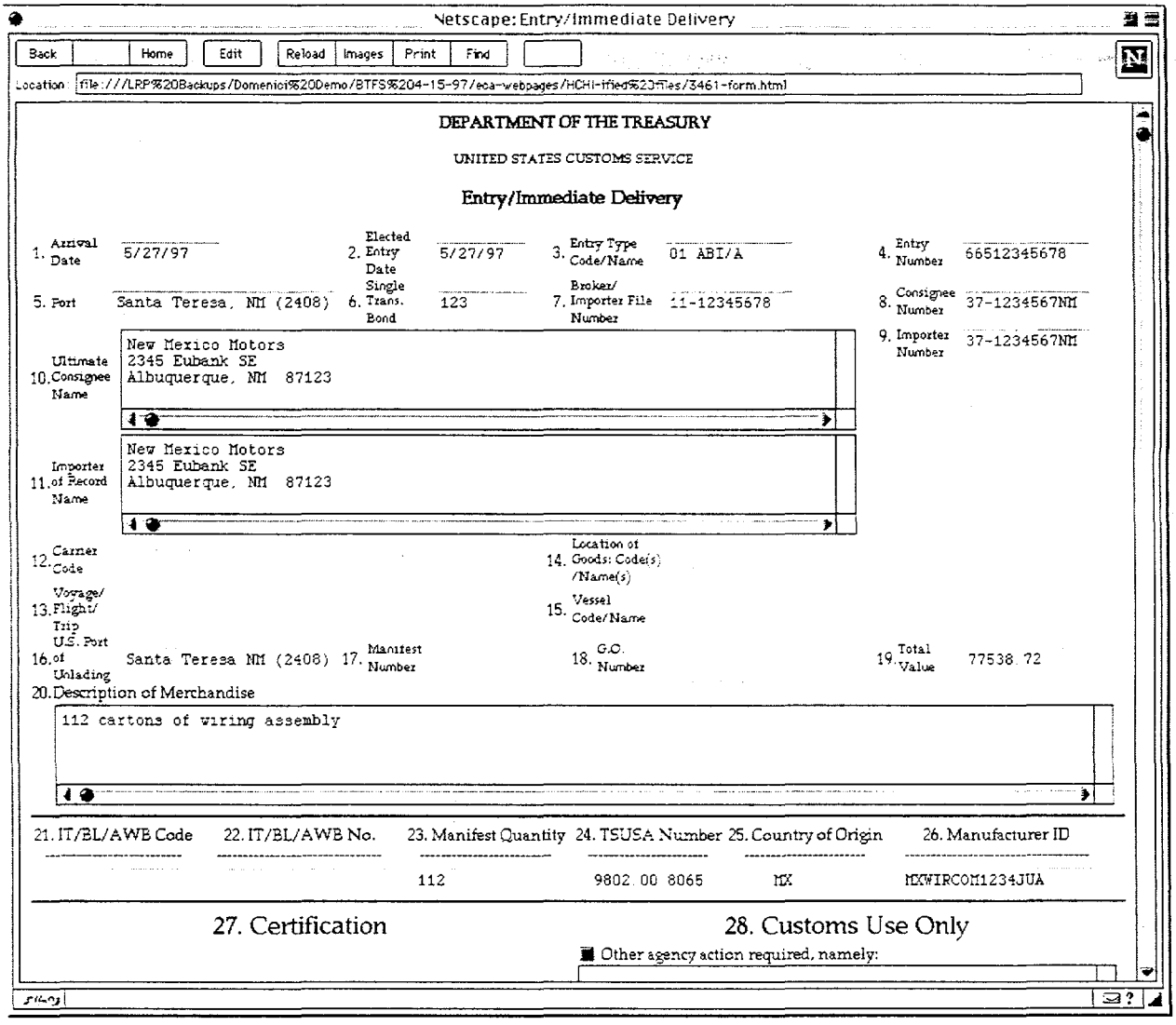
Totales:
Efectivo: 0
Otros: 89
Total: 89

Patente: 8776
Nombre: Jaime Gonzalez
RFC: GOJA-560505gjf
Firma de agente:

Agregue 1 linea(s) | Analize | Guarde | Termine | Resetear | Desechar

Destino/Origen: Franja Fronteriza

5. Fill out required forms (b)



Netscape: Entry/Immediate Delivery

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Location: file:///LRP%20Backups/Domenici%20Demo/BTFS%204-15-97/eca-webpages/HCHI-ified%20Files/3461-form.html

DEPARTMENT OF THE TREASURY

UNITED STATES CUSTOMS SERVICE

Entry/Immediate Delivery

1. Arrival Date	5/27/97	2. Elected Entry Date	5/27/97	3. Entry Type Code/Name	01 ABI/A	4. Entry Number	66512345678
5. Port	Santa Teresa, NM (2408)	6. Single Trans. Bond	123	7. Broker/ Importer File Number	11-12345678	8. Consignee Number	37-1234567NM
						9. Importer Number	37-1234567NM

10. Ultimate Consignee Name:
New Mexico Motors
2345 Eubank SE
Albuquerque, NM 87123

11. Importer of Record Name:
New Mexico Motors
2345 Eubank SE
Albuquerque, NM 87123

12. Carrier Code		14. Location of Goods: Code(s) /Name(s)			
13. Voyage/ Flight/ Trip		15. Vessel Code/Name			
16. U.S. Port of Unlading	Santa Teresa NM (2408)	17. Manifest Number	18. G.O. Number	19. Total Value	77538.72

20. Description of Merchandise

112 cartons of wiring assembly

21. IT/BL/AWB Code	22. IT/BL/AWB No.	23. Manifest Quantity	24. TSUSA Number	25. Country of Origin	26. Manufacturer ID
		112	9802.00.8065	MX	MXWIRCOM1234JUA

27. Certification

28. Customs Use Only

Other agency action required, namely:

6. Initiate verified transaction; inspect open transactions