Development of a Web-Service Prototype for Blood Bank Product Management according to the ISBT 128 Standard

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The aim of this project

- The aim of this project was the development of an ISBT 128 compliant prototype of interface descriptions, in Web Service Definition Language (WSDL), allowing for network based blood products management.
- ISBT 128 sets a global standard for the identification, labelling, and information processing of human blood, tissue and organ products across international borders and disparate health care systems.
- WSDL is an XML format for describing network services as a set of endpoints operating on messages containing either document or procedure oriented information.

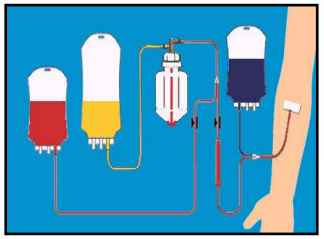
The web-services for Blood-bank management

- The web-services for Blood-bank management of the developed system are grouped in:
  - *Donation Centre.*
  - *Laboratory.*
  - *Transportation and Storage.*
  - *Hospital Services.*

  according to the pending organizational reform in the Blood-bank network in Greece.
- The system is presently running successfully in a web environment in our laboratory.

Properties of the system

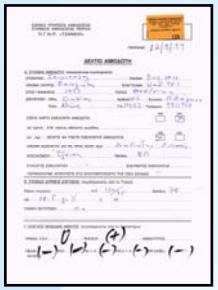
- The developed Web service is a software system designed to support interoperable machine-to-machine interaction over a network.
- It has an interface that is described in a machine process able format such as WSDL.
- The features of the system comply with the ISBT 128 entities.
- Other systems may interact with the Web service in a manner prescribed by its interface, by employing appropriate messages.

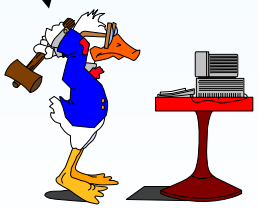


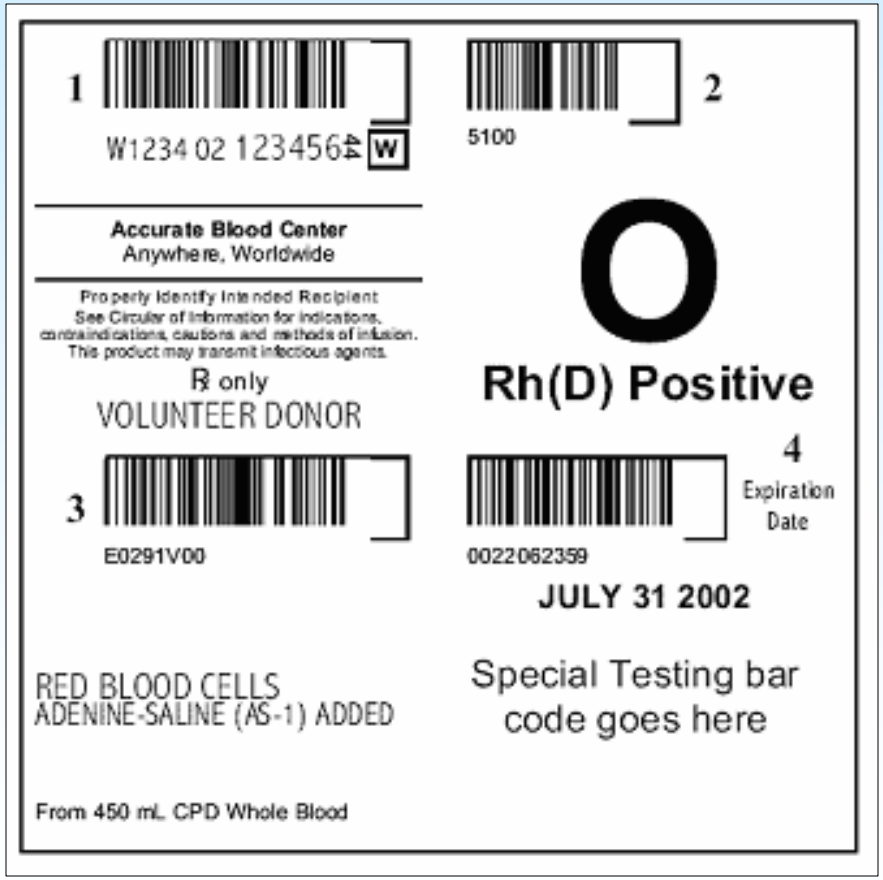
The ISBT 128 specified entities of the developed Web service system

Item	Description
1	A donation numbering system that ensures globally unique identification.
2	The information to be transferred, using internationally agreed reference tables.
3	An international product reference database.
4	The data structures in which this information is placed.
5	A bar coding system for transfer of the information on the product label.
6	A standard layout for the product label.
7	A standard reference for use in electronic messaging.

A typical ISBT 128 Label for red cells







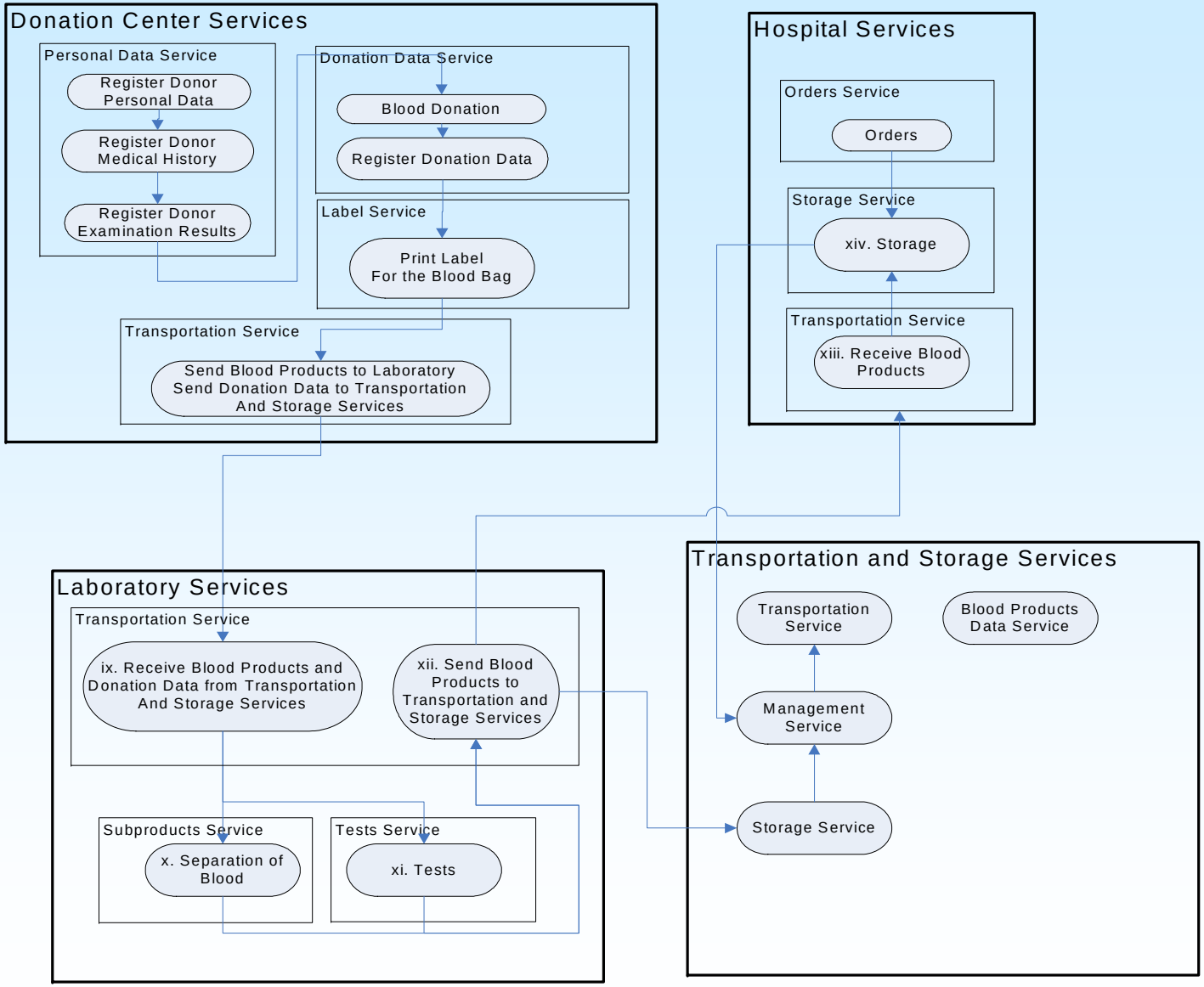
Structure of the Web services

- These messages are typically conveyed using HTTP, and normally comprise of XML in conjunction with other Web-related standards.
- Software applications written:
  - *First, in various programming languages.*
  - *Second, running on various platforms*

  can use the web services, in order to exchange data over computer networks and over the Internet.
- The web services for blood bank management comprise of:
  - *First, Donation Centres Services.*
  - *Second, Laboratory Services.*
  - *Third, Transportation and Storage Services.*
  - *Fourth, Hospital Services.*

Schematic representation of the outline of the developed web-services

Donation Centre Web services provided	**Laboratory** Web services provided	**Transportation & Storage** Web services provided	**Hospital** Web services provided
Personal Data	Transportation	Transportation	Ordering
Donation Data	Sub products	Blood Products' Data	Storage
Label	Tests	Storage	Transportation
Transportation		Management	


Donation Center Services
Personal Data Service
Register Donor Personal Data
Register Donor Medical History
Register Donor Examination Results
Donation Data Service
Blood Donation
Register Donation Data
Label Service
Print Label For the Blood Bag
Transportation Service
Send Blood Products to Laboratory Send Donation Data to Transportation And Storage Services
Hospital Services
Orders Service
Orders
Storage Service
xiv. Storage
Transportation Service
xiii. Receive Blood Products
Laboratory Services
Transportation Service
ix. Receive Blood Products and Donation Data from Transportation And Storage Services
xii. Send Blood Products to Transportation and Storage Services
Subproducts Service
x. Separation of Blood
Tests Service
xi. Tests
Transportation and Storage Services
Transportation Service
Blood Products Data Service
Management Service
Storage Service

The Donation Centre Services and the Laboratory Services groups

- The ***Donation Centre Services*** group includes the Personal Data, Donation Data, Label and Transportation Services.
- *The Personal Data Service* registers the personal data of the donor, his medical history, and the examination results before the donation, and assigns a new Donor ID, according to the ISBT128 rules.
- *The Donation Data Service* assigns a new Donation ID and stores the blood product type, the determined blood group, the donor ID, the collection date and time, the container manufacturer catalogue number and LOT, and the Staff ID.
- *The Label Service* returns the ISBT128 codes for the labels on the container.
- *The Transportation Service* stores the data of the blood product carrier, its destination, and forwards Donation Data to the Transportation & Storage Services Group Server.

- The ***Laboratory Services*** group comprises of the Transportation, the Sub products, and the Tests Services.
- *The Transportation Service* records the incoming and outgoing blood products, receives the donation data and updates the Storage Services Group Server for the availability of blood products.
- *The Sub products Service* records, which products have been extracted from each donation.
- *The Tests Service* records the results of the Antigens tests, and of the HIV, HBV, HCV, HTLV, RPR etc. tests.

Transportation and Storage Services and Hospital Services groups

- The ***Transportation and Storage Services*** group run the Transportation, Blood Products Data, Storage, and Management Services.
- The *Storage Service* provides information about the transportation availability of blood products, from the Laboratory or from one hospital to another.
- The *Blood Products Data Service* stores the all the information about blood products based on the Donation ID.
- The *Management Service* checks the availability of blood products, administrates the orders, and manages the final destinations of the products.
- The *Transportation Service* stores the information of the number of blood products are on their way, and the estimated transportation time.

- The ***Hospital Services*** group includes the Order, Storage and the Transportation Services.
- The *Order Service* takes orders for direct donation from the client program of the physicians in charge.
- The *Storage Service* manages the blood products available in the Hospital and forwards the Orders to the Management Service of the Transportation Group.
- Finally, the *Transportation Service* stores the information of the overall blood product movements.

Concluding Remarks

- The developed system covers an existing managerial gap, by proposing a standard way of information and products exchange, between blood processing and transfusion points, fully complying with ISBT128, 2002/98/EC and HL7.
- We have implemented one possible scenario of the pending organizational reform in the Blood-bank network in Greece; however, the Donation Centre, Laboratory, Transportation and Storage, and Hospital Services grouping approach, allows for, the fast redesign of the system, in order to be easily adapted, to the final decisions of the Ministry of Health.
- The system is presently running successfully in a web environment in our laboratory, and in a next stage, we will attempt to extend international consistency to support the transfer, transfusion or transplantation, of cell and tissue products, according always to the ISBT 128 standard.