ASYCUDA

Automated SYstem for CUstoms DAta

ASYCUDA ++
DESCRIPTION OF APPLICATION SOFTWARE
(TECHNICAL OVERVIEW)

United Nations Conference on Trade and Development

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1 THE ASYCUDA++ ENVIRONMENT

1.1 General Description

1.1.1 Development

As part of its technical co-operation activities UNCTAD has developed ASYCUDA (Automated SYstem for CUstoms DAta) to bring about a better management of Government finances through an institutional strengthening of Customs Administrations. The main achievements by the system are simplified procedures providing a reliable and efficient environment for Customs itself as well as for the business community involved in international trade.

Over time, the software has been improved as the result of use in the practical Customs clearance and statistical environment. Today over 70 countries are involved in the programme.

1.1.2 International standard data

The system uses all international standards for trade data under the conventions and recommendations of such bodies as the World Customs Organisation and the International Standards Organisation. Since the system also supports simplified and harmonised Customs procedures as laid down by the Kyoto Convention, and other international instruments, ASYCUDA has become a catalyst for modernisation of Customs Administrations as a whole.

1.1.3 Feeder system

ASYCUDA is based in the working Customs environment to process and control import and export consignments. Although its primary function is to secure and account for all revenue accurately and efficiently, ASYCUDA provides an automatic feeder system to other software systems with the provision of analyzed and comparative trade and fiscal data.

1.1.4 Flexibility

While basic Customs and statistical data systems are fairly similar at the highest generalised level, it is clear that the fiscal systems on which they are based, that is to say the tariff, taxation and exemption regimes, can differ widely and are subject to constant change. Needs in terms of control, revenue collection and information can also differ. Consequently, any Customs data system must provide sufficient flexibility to cope with these differences.

ASYCUDA++ comes with an advanced configuration module which allows the national Customs administration to configure the system to its own needs and national regulations. This module facilitates the definition of mandatory and conditional data elements, the structure and format that such data should take (numeric, alphanumeric), and the specification of validation checks that will be performed against it.

A system of indexed master tables ensures user friendly and efficient management of the large amounts of reference data which can potentially relate to a given transaction; for example country and

currency codes, exchange rates (present and historical), means of transportation, means of payment, and thus provide all of the information which may relate to a Customs declaration.

The flexibility that has been incorporated into the design of ASYCUDA++ reflects a conscious decision to avoid the imposition of organisational patterns upon national Customs administrations. The large degree of "parameterisation" offers a range of possibilities in terms of adaptability to varying models of control and organisation. In this way, the precise requirements of Customs can be satisfied.

ASYCUDA has been specifically designed so that modifications of the source code in this context are not required. The same is also true of the fiscal systems. Customs staff are fully trained to use this flexibility and to manage the whole range of modules independently.

1.1.5   Security

Security is of paramount importance. Access to the system by Customs and where applicable, the trading community, is controlled by passwords down to the lowest level of user to ensure that no unauthorised use of the facilities is permitted. Furthermore, both work stations and users are individually authorized for certain functions only. Thus, access to a function will only be possible if both the work station and the user have overlapping clearance. In addition the full security features of the UNIX operating system are available such as a Log Book, which keeps a track on the performance of the individual users.

Access to the SERVER is completely controlled by the UNCTAD developed Message Handler. The Message Handler carries out, and validates, the transfer of messages (service requests and data) between the ASYCUDA++ engine and appropriate external interfaces.

1.2   Potential Benefits from the System

In those countries where ASYCUDA has been installed, direct benefits have been realized, including:

- •   faster processing of declarations and thus clearance;
- •   more efficient controls;
- •   accurate and detailed accounting;
- •   increased revenue;
- •   accurate and timely data on external trade.

Indirect benefits include:

- •   better and faster economic decision-making;
- •   an optimisation of available personnel resources;
- •   simpler procedures and documentation for the trade;
- •   easy aggregation of data at international level;
- •   increasing revenue from other sources such as income and company taxation, and taxes on consumption, as the Customs system data can be cross-referred.

2 THE ASYCUDA⁺⁺ ARCHITECTURE

2.1 The Technical Setup

This description explains the software components of ASYCUDA++, i.e. the server and the client work stations with their inter-relationships.

• A Client/Server architecture provides the system with the full flexibility and efficiency required by the most sophisticated modern computer systems.

• A LAN/WAN architecture allows for a large number of users to input and process data without performance degradation.

• The choice of UNIX as the Server's operating system gives the user countries flexibility regarding choice of computer model and size (from the 486 PC to mainframe). This leaves the decision to upgrade with the user, along with the security of knowing that any increase in processing capacity will not compromise the utility of existing equipment.

• The terminals used with the system are all intelligent DOS based PC work stations. The choice of such a 'front end' has been based on the fact that many potential ASYCUDA users will have had some previous experience with DOS based software, and are therefore confident and comfortable dealing with widely known environment. Furthermore, when not engaged in declaration processing, the client computers are available to carry out different functions such as word-processing, spreadsheet, etc.

The design of ASYCUDA++ is based on the three main concepts Flexibility, Independence and Open Environment which are described below.

2.2 Flexibility

ASYCUDA++ has been designed to fully satisfy the needs of Customs and Statistical Services in relation to foreign trade transactions, starting from the most basic Customs functions and going on to more complex user-defined facilities. Consequently it is suitable for use in the smallest Customs offices as well as in large regional offices with very high throughput of declarations and where there is a need for a much more sophisticated environment.

This flexibility means that the system aims to deal with potentially large transactions volumes without jeopardising the user friendly interface which is an essential requirement for the modern Customs office. Thus, it caters for a range of users whilst offering an obvious advantage in its ability to grow as the computerisation process evolves.

2.3 Independence

To facilitate development of the system and to maintain a degree of independence from proprietary software, ASYCUDA++ has been developed in a modular fashion. This approach has left the development team with the option of altering a software platform (for instance the relational database) without having to program changes throughout the system; only the layer of functions which interact directly with the application software would require conversion.

The complete ASYCUDA++ configuration consists of three different types of programs:

•   Commercial products

INFORMIX or ORACLE as server RDBMS Engines, DOS and UNIX as Operating Systems, TCP/IP for communications through an Ethernet or Token Ring networks.

•   The ASYCUDA Engines and User Interface
These modules are developed by UNCTAD, and are the core of the system processing and data manipulation. These are designed to be re-usable in case of upgrades of the commercial products mentioned above.

•   Message Handlers and SQL Interfaces

These UNCTAD designed modules are the only programs that would require modifications if the proprietary software (commercial products) were upgraded or replaced.

2.4   Open Environment

An ASYCUDA++ gateway module permits automatic exchange of information between servers, i.e. Sub-systems, within the national ASYCUDA system and also between ASYCUDA and external parties.

One of the system's basic functions is message handling which greatly facilitates the communications requirements with other institutions such as Customs brokers, carriers, banks ...

2.5   Development platform

The ASYCUDA++ system is designed to meet the standard requirements of customs procedures automatization in a number of countries, however there are specific demands for each country, which cannot be accommodated into a system like this.

The ASYCUDA++ Development Platform (A++DP) is a set of files and utilities that allows the national team programmers to extend the functionalities of ASYCUDA++, based on the flexible design of this system. Using this platform it's easy to program new modules like the ones provided in the client interface in a very short time, without altering the core of the system and remaining compatible with future releases.

The applications created with the A++DP can also make use of all the data managed by the system and add new functions and information, using the objects and procedures already developed for ASYCUDA++.

3 THE SERVER AND THE CLIENT

3.1 The Server

• TCP/IP
Standard communications protocol.

• Message handler
The message handler carries out, and validates, the transfer of messages (data) between the ASYCUDA++ Engine and appropriate external interfaces.

• ASYCUDA Engine
The ASYCUDA engine is the central processing machine. It receives, evaluates, prepares, and returns data: it is the functional kernel of the system. This is the part of the system which has no need of modification when external software parameters are changed. The Engine will always be changed however, when additional functionality is added to the system.

• SQL interface
The modular structure of ASYCUDA++ enables ease of change of the Relational database management system.

• Relational Database Management System
One of the important features within the RDBMS is its rollback facility which ensures data integrity by 'rolling back' all updates should any abnormality be detected during the execution of the update modules.

An interface with RDBMS engines different from ORACLE or INFORMIX could be developed for further releases of ASYCUDA in accordance with the needs of countries and changes in the software marketplace.

• Operating System
UNIX, along with being a recognised standard for open systems, offers the following additional advantages:

> The portability means that the initial investment in UNIX is small, and significant upgrade in processing power can occur within a relatively low cost framework;

> UNIX is presented as the standard development environment for most computer orientated technical studies. The recruitment of personnel charged with the system's supervision is therefore relatively straightforward.

SERVER

TCP / IP

Message Handler

ASYCUDA Engine

SQL Interface

Server
DBMS Engine

UNIX
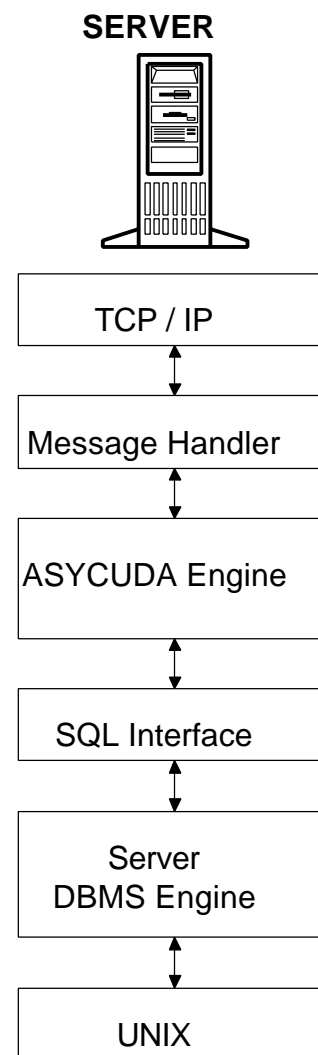
3.2   The Client Work Station

WORKSTATION

• **TCP/IP**
Standard communications protocol.

TCP / IP

• **Message handler**
The message handler carries out, and validates, the transfer of messages (data) between the ASYCUDA++ engine and appropriate external interfaces.

Message Handler

• **User Interface**
The user interface is presented through a series of window driven screens, which offers maximum flexibility to the user along with an environment (WINDOWS like) with which many will be familiar. A multi-lingual on-line help system is also included which enables a new user to be productive without constantly needing to refer to books and manuals which distract him from the task in hand.

User Interface

• **Local Engine**
To avoid unnecessary access to the network, the system reference or 'control' files are downloaded and automatically updated at the Work Station so that much interim validation can be carried out at a local level. It is only when the ASYCUDA++ transaction files are to be updated that the network is used and final validation is carried out against the master database.

Local Engine

SQL Interface

• **Database Interface**
The modular structure of ASYCUDA++ enables ease of change of the local engine (currently the PARADOX engine).

Local DBMS Engine

MS-DOS 5.0

• **Relational Database Management System**
The PARADOX database "engine" is subject to licence fees only for the development system. This means that the end user incurs no additional fee. PARADOX is one of the best known RDBMS's under DOS.

• **Operating System**
Its ease of use, its low cost and the access it gives to a large library of applications explain the choice of DOS. Should future releases of ASYCUDA require another operating system, DOS could easily be replaced due to the modular design of the software.