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Economic Commission for Europe

Inland Transport Committee

Working Party on Customs Questions affecting Transport

Informal Ad hoc Expert Group on Conceptual and Technical Aspects of Computerization of the TIR Procedure

Twentieth session
Prague, 19-20 April 2012
Item 5 of the provisional agenda
Financial implications of the introduction of the eTIR international system

World Customs Organisation contribution to the cost assessment for the establishment of the centralized eTIR international system

Note by the secretariat

I. Introduction

1. In reply to a request to contribute to the cost assessment for the establishment of the centralized eTIR international system, the World Customs Organisation (WCO) secretariat provided feedback with regard to the following projects: the Globally Networked Customs (GNC) project, the Customs Enforcement Network (CEN) and the eATA Carnet Project.

2. The GNC project is still under discussion and no final information on its envisaged implementation costs are, as yet, available. CEN has been developed over several years through a combination of direct funding and donations from WCO members, both in kind and in the form of technical support. The WCO secretariat resources required to manage the network are, at present, 2.5 staff. Donations have been received for the amount of 200,000 Euros towards the development of the national components of the CEN (nCEN). Finally, in annex, the secretariat reproduces a document on the eATA project, including a part on the estimated costs of a centralised global eATA carnet system.

WORLD CUSTOMS ORGANIZATION
ORGANISATION MONDIALE DES DOUANES
Established in 1952 as the Customs Co-operation Council
Créée en 1952 sous le nom de Conseil de coopération douanière

ADMINISTRATIVE COMMITTEE
Istanbul Convention
11th Meeting
-
CONTRACTING PARTIES
ATA Convention
8th Meeting
-

PA0071E1a

Brussels, 6 January 2012.

eATA CARNET PROJECT

(Item V on the Agenda)

1. Members will recall that the Istanbul/ATA Administrative Committee (Committee) has for a number of years time been working on the feasibility of introducing a global eATA system.

2. An eATA Carnet Working Group was set up in November 2006 and a Feasibility Study produced. (a copy of this Study may be found in Annex I to this document) Subsequently the Committee decided that in order to advance the work further it would be necessary to carry out a cost analysis of the Feasibility Study. The Committee was however unable to agree on a funding mechanism for the cost analysis Study and the 10th meeting of the Committee concluded in March 2010 that "'there was strong commitment and support among stakeholders and members to explore and continue looking for opportunities to move forward with eATA project. The slowdown is a result of budgetary pressures and not of commitment".

3. Since that time the European Commission (EC) provided funds for such a cost Study and has generously offered the results to the Committee in order to advance the work on the eATA Carnet Project. At this stage an extract of the complete report has been provided by the EC and is attached at Annex II.

4. The eATA Carnet WG met in July 2011 following the completion of the cost analysis Study and was attended by a number of interested WCO members, the ICC/WCF, EC and Members of the WCO Secretariat. The UNECE, working on the eTIR project also attended. The following were the main points/issues raised at that meeting:

   - The EC made it clear that the report of the cost analysis study did not belong solely to the European Commission but was made for the benefit of all Members

- ICC/WCF raised several concerns about, for instance, the absence of reference to the role of national guaranteeing organisations as it may be different from that of issuing organisations; the role of issuing and guaranteeing organizations in the central system; the possibility for Carnet holders to interact directly with the central system, etc.ICC/. WCF also considered that Customs should be able to initiate a claim from the central system.
- There was also discussion about the advantages of cloud computing vs traditional internet; Build Operating Transfer (BOT) or outsourcing the creation and management of the system.
- The desirability of a pilot test phase in realising the system. A number of Members were identified as potential participants in the pilot phase They would be invited to join on a voluntary basis and agree to work with their respective national guaranteeing organizations.
- On legal issues, the question was raised on the need and desirability to amend the Conventions to accommodate the global central system and it was suggested to consider the insertion of an Article that would enable the use of eATA by Contracting Parties bearing in mind that eATA would eventually replace the paper system.
- The eATA Carnet Working Group set up a forum for further comment and discussion.

5. The Director, Compliance and Facilitation also wrote to Contracting Parties in December 2011 requesting that they continue to support this important project, which is fully in keeping with Globally Networked Customs which in turn is a fundamental building block of Customs in the 21st Century.

6. This document will be included on the agenda for the forthcoming Istanbul/ ATA Committee to be held from 22 – 23 March 2012 but is being issued in advance of the full agenda for the meeting in order to give Members time to reacquaint themselves with this project and its current developments and to consult internally. The Secretariat will also invite the EC to make a comprehensive presentation on the Study at the Committee.

7. It is clear from the report that implementing a fully electronic ATA Carnet System would be feasible and equally clear that this would be a long term project presenting major challenges such as the type of system and its development, implementation maintenance and financing.

8. The Committee is requested to examine this issue and exchange views on the future of this project, in particular to reaffirm its commitment to the continuation of the work through the eATA Carnet WG as well as to provide any comments/ guidance to the Working Group

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WORLD CUSTOMS ORGANIZATION
(Version of 16 January 2008)

Study on the feasibility of introducing a centralised, global e-ATA carnet system

RATIONALE FOR DEVELOPING A CENTRALISED GLOBAL SYSTEM

A centralised, global eATA system would fit in with the general philosophy of operating in a paperless environment. The paper-based ATA carnet procedure will increasingly become redundant as it is not compatible with modern techniques and working methods.

The information obtained from the returned vouchers would enable discharge of carnets, currently a major problem, to be more reliable in an electronic system.

Traceability and improvements in the use of the ATA carnet from the point of destination back to the point of issuing could be achieved using a centralised, global system.

Access to/use of a centralised, global system for Contracting Parties to the ATA and Istanbul Conventions. In the view of the Working Party there would be no reasonable alternative to having such a system.

Time saving, for instance because about 80% of the data (general data) is already in the centralised, global system and can be reused at the next step in the ATA carnet procedure.

Win/Win situation for all parties involved through automation, for example no loss of Carnets, all data is stored in the centralised, global system, real-time "on-line" update of the virtual Carnet.

Statistics for all authorized parties easier to compile.

Increased accuracy as less data to be manipulated.

Currency converter for Customs purposes.

Compatibility with Single Window principle.

Risk of double registration and the issuance of fraudulent carnets may be reduced.

End of validity and alert messages may simplify significantly the application of the ATA procedure and facilitate the claims process.

The holder of an eATA carnet does not have the obligation to return his carnet after use, thereby rendering the discharge procedure more efficient.

PROPOSED DESCRIPTION OF A CENTRALISED, GLOBAL SYSTEM (see also appendix to this Annex)

Application and issuing/validating the carnet

1. The competent Customs authority may choose to work directly from the centralised global system or interface to this system through a national system, which would constitute the system of official record for the Customs Administration. The original would remain in the centralised, global system.

2. The applicant who intends to use an eATA carnet visits, on the internet, the homepage of the national guaranteeing association or one of its authorized local chambers responsible for ATA Carnets in his country. On this website a virtual ATA carnet form may be completed. The applicant has to fill in the virtual ATA carnet in order to be contractually obligated to the national guaranteeing association or one of its authorized local chambers.

3. Based on the information given by the applicant the national guaranteeing association or one of its authorized local chambers examines whether it can issue/validate a virtual carnet. If yes, it informs the applicant that a virtual ATA carnet will be issued/validated subject to the prior payment of fees or provision of a guarantee and payment of fees. Once these conditions are fulfilled, the national guaranteeing association or one of its authorized local chambers issues/validates the virtual ATA carnet in the system. The issuing chamber of commerce informs the holder by email that the carnet may be used and communicates the carnet number with the corresponding username and password. The holder of a virtual ATA carnet is able to consult the global, centralised system and to download a copy of the carnet up to one year after the end of the period of validity. Modifications cannot be made by the holder ("read-only" mode).

Use of the carnet

4. The holder of the carnet or his representative presents the temporary export goods to Customs authorities and informs them of the carnet number. Customs authorities may check the identity of the person (legal or natural) who has presented the goods. Thereby it is ensured that only the authorized person can access the centralised, global system. Customs complete the relevant points of the exportation section of the virtual ATA carnet and carry out the necessary Customs formalities and record the results/remarks in their national or the centralized global system. The updated virtual ATA carnet is uploaded to the national system or directly to the centralised, global system. The same procedure applies *mutatis mutandis* with regard to the importation, re-exportation, re-importation of the goods and the transit operations.

Archive

5. The centralised, global system will generate automatically an "end of validity message" which will be sent to the issuing Chamber of Commerce when the corresponding carnet has expired. If so, the issuing Chamber of Commerce has to download the corresponding virtual total carnet-file from the centralised, global system and to archive it on the national system. Such downloading will not delete the virtual carnet from the centralised, global system.

6. Only complete files may be downloaded from the centralised, global system.

Irregularities

7. The centralised, global system will automatically generate an "alert-message" which will be sent to the competent Customs authorities if the temporary admission procedure was not discharged correctly. This message can be used to initiate the claim procedure.

General requirements

Administrator of the system

8. The view of the Customs administrations responding to a questionnaire was overwhelmingly in favour of the International Chamber of Commerce/World Chambers Federation (ICC/WCF) taking on the role of administrator of the centralized, global system.

9. ICC/WCF have taken note of this view and felt that this issue should first be the subject of an in-depth study of all the implications involved in such a project (i.e. operational, managerial, legal, financial, etc.) by all the major stakeholders concerned, as presently represented in the WCO eATA Carnet working group (i.e. WCO, EU and Customs administrations; ICC/WCF and member organizations of the ATA Guarantee Chain).

Access to the system

10. National guaranteeing associations or their authorized local chambers on the national territory, Customs authorities and the carnet holder may access the relevant ATA carnets and associated information which are available on the centralised global system run by an administrator . Such access requires individual usernames and passwords attributed by the administrator.

Multi-user environment

11. The centralised, global system must allow several users to work simultaneously, 7 x 24 hrs, while guaranteeing coherence and acceptable performance in terms of response time.

Supporting documentation/language versions

12. The centralised, global system must provide the possibility to store all official language versions of the ATA carnet. It must also be capable of storing supporting documentation, such as health, phytosanitary and CITES certificates, as well as linking the translations of all related documents that the Customs office of temporary importation needs.

Data security

13. Every interaction with the centralised, global system whether from the administrator, from national guaranteeing associations or their authorised local chambers or from Customs authorities or the carnet holder, must be subject to authentication and authorisation controls All data must be transmitted in a form impossible to read by unauthorized persons (encrypted information). If the Customs administration employs a national system data security will be in accordance with national data protection requirements.

Data requirements

14. The data required according to the current ATA Carnet and analysed Business Processes, the administrator, local Chamber of Commerce, national guaranteeing association and/or Customs will be mapped against the data requirements as defined in the WCO Data Model.

Integrity

15. The centralised, global system must preserve the consistency of all data concerned. It will protect the data against modification and loss during transfer.

Availability of data

16. The centralised, global system must keep track of all data submitted (creation, modification, correction, etc.). The data must be available during the validity of the ATA Carnet. After the period of validity the complete file of the ATA Carnet will be available in archive for one year for the Carnet holder and for ten years for the Customs administrations and the Issuing/Guaranteeing association. The Customs administration can download completed files when they have ended their life time and store those copied files on their own national system if required.

Audit

17. It will be possible to audit any data that was changed, when and by whom. Auditing the completed files “stored” in the archive would only be possible via the administrator of the system.

Statistics

18. The possibility of generating statistical information should be provided for by the administrator and sent for information and confirmation to the first body responsible for that information e.g. the local Chamber of Commerce. This national/regional/local information may be sent to other relevant authorities involved in the Carnet procedure.

Printing

19. The Carnet holder will have the ability to print out the carnet at any stage of the process during accessibility, for their personal use, as noted in the'Availability of Data' section above.

Emergency situations

20. Procedures to cover emergency situations should be in place so as not to hamper/stop using the ATA procedure.

Main pre-requisites for a centralised, global system

21. The internet based electronic system will eventually replace the paper-based ATA carnet procedure. However, the paper-based ATA carnets may be used alternatively for a transitional period.

22. The system does not require any new roles and responsibilities either for Customs administrations or for national guaranteeing associations. For instance, this means that the procedure for claims made against the guarantee by Customs will remain the same under an e-ATA system.

23. Customs formalities may be carried out via a national Customs system which will be interfaced with the centralised, global system.

24. Additional information, in comparison with the paper-based ATA carnet procedure, may be required only if this is allowed in accordance with the ATA/Istanbul Convention.

25. Maintenance/upgrading of the system must be possible. Central and national Helpdesks should be set up.

26. Amendments to the ATA and Istanbul Conventions will be necessary.

The eATA Carnet Woking Group is of the opinion that a centralised, global system as described above is feasible from a technical and organisational point of view

DECISIONS REQUIRED BY THE ADMINISTRATIVE COMMITTEE

27. In a questionnaire to all ATA and Istanbul Convention Contracting Parties – a summary of which may be found at Annex 2 all agreed that it was desirable in principle to develop such a system, subject of course to a full cost analysis in particular. The Administrative Committee is invited to give its opinion on this point.

28. If the Administrative Committee decides to pursue this project it is invited to consider whether the functioning of the system as outlined is acceptable or whether it would wish to make changes.

29. It is recommended by the Working Group that following on from the present Study a full cost analysis is now needed. The Administrative Committee is requested to confirm that such an analysis is required.

30. If a cost analysis study is confirmed it is proposed by the WG that a suitable company be contracted to carry out this. Funding for such a study remains to be determined and the advice of the Administrative Committee is sought in this respect.

31. The Administrative Committee is requested to agree that the eATA carnet Working Group continue meeting on a regular basis to pursue this project.

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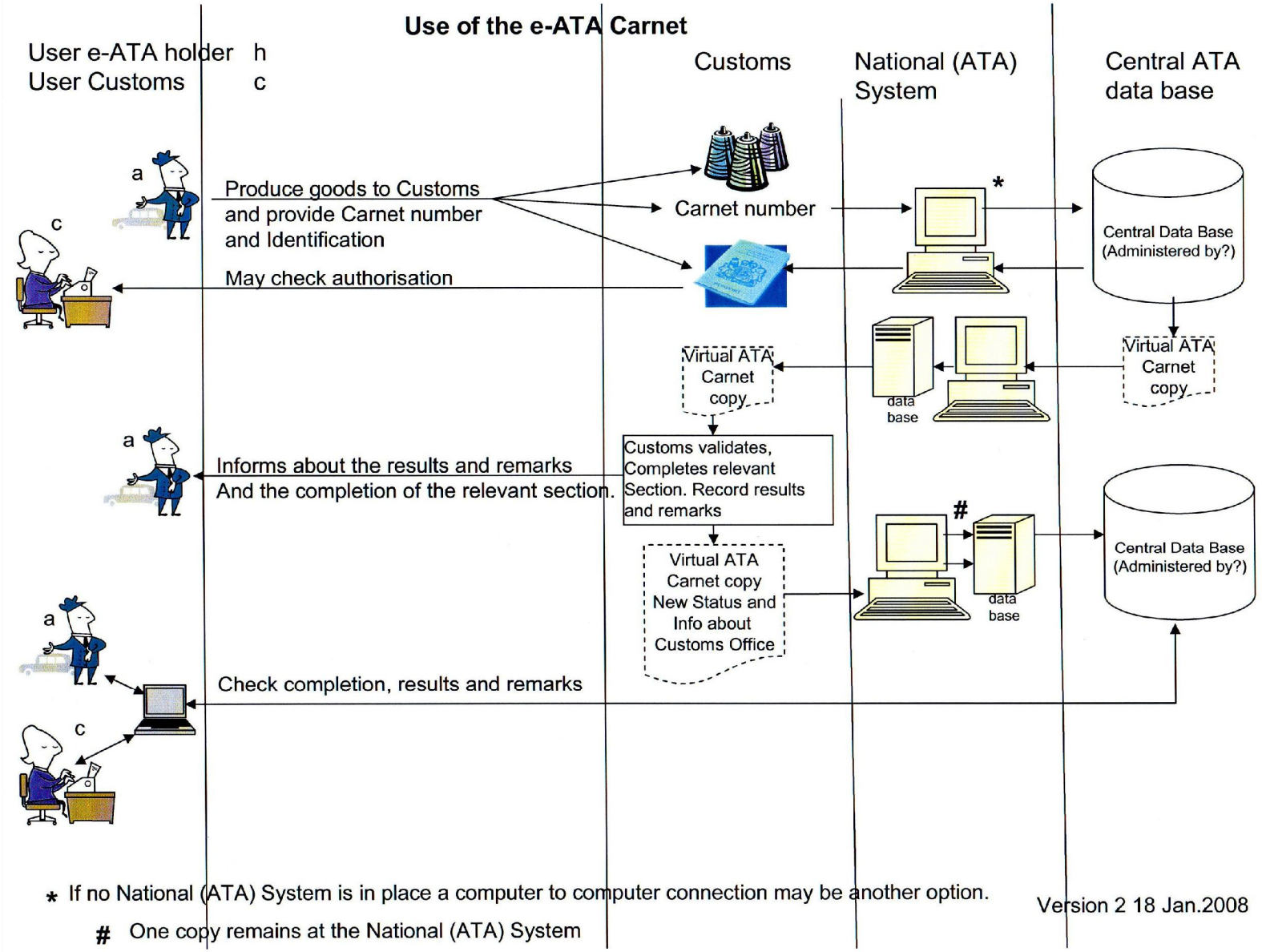

* If no National (ATA) System is in place a computer to computer connection may be another option.

\# One copy remains at the National (ATA) System

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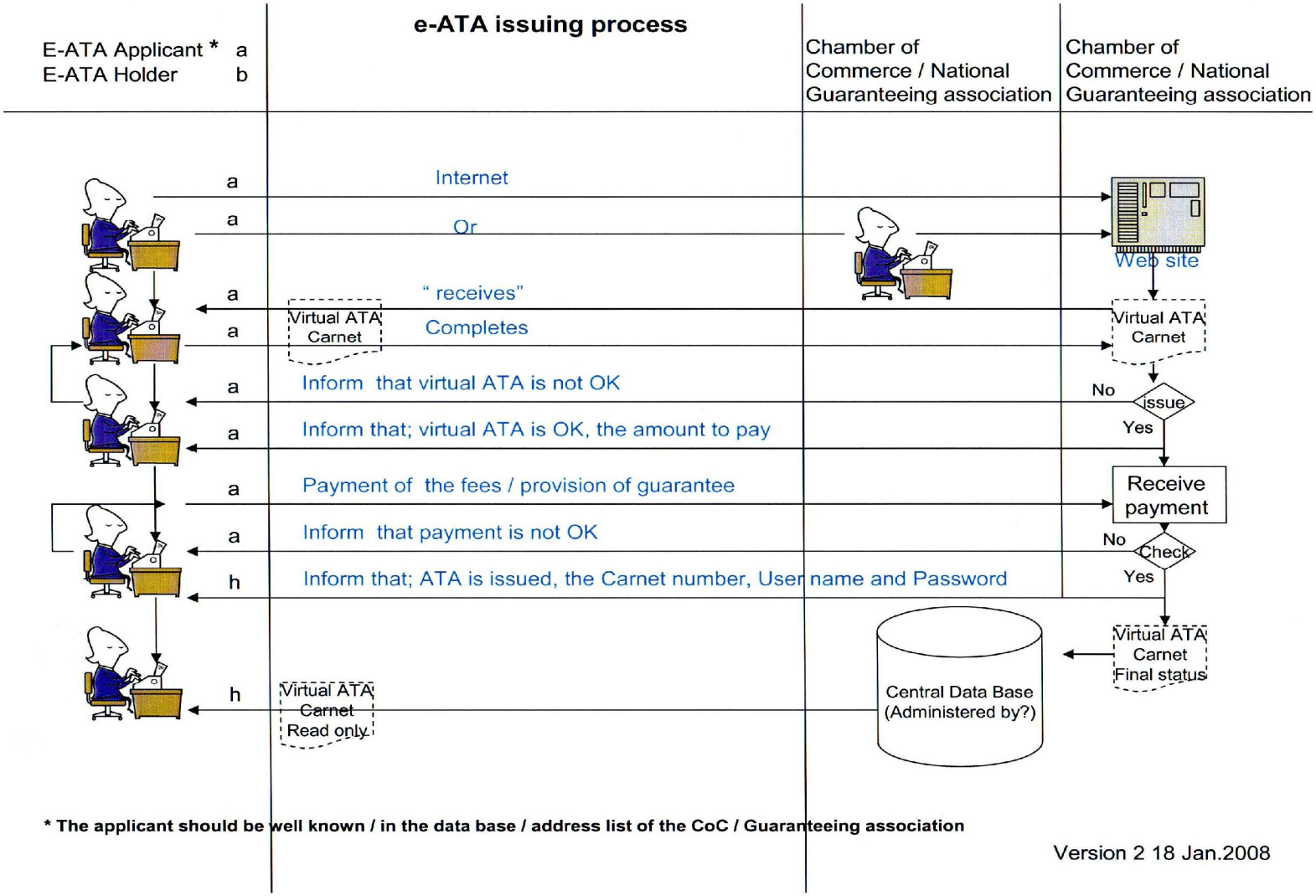
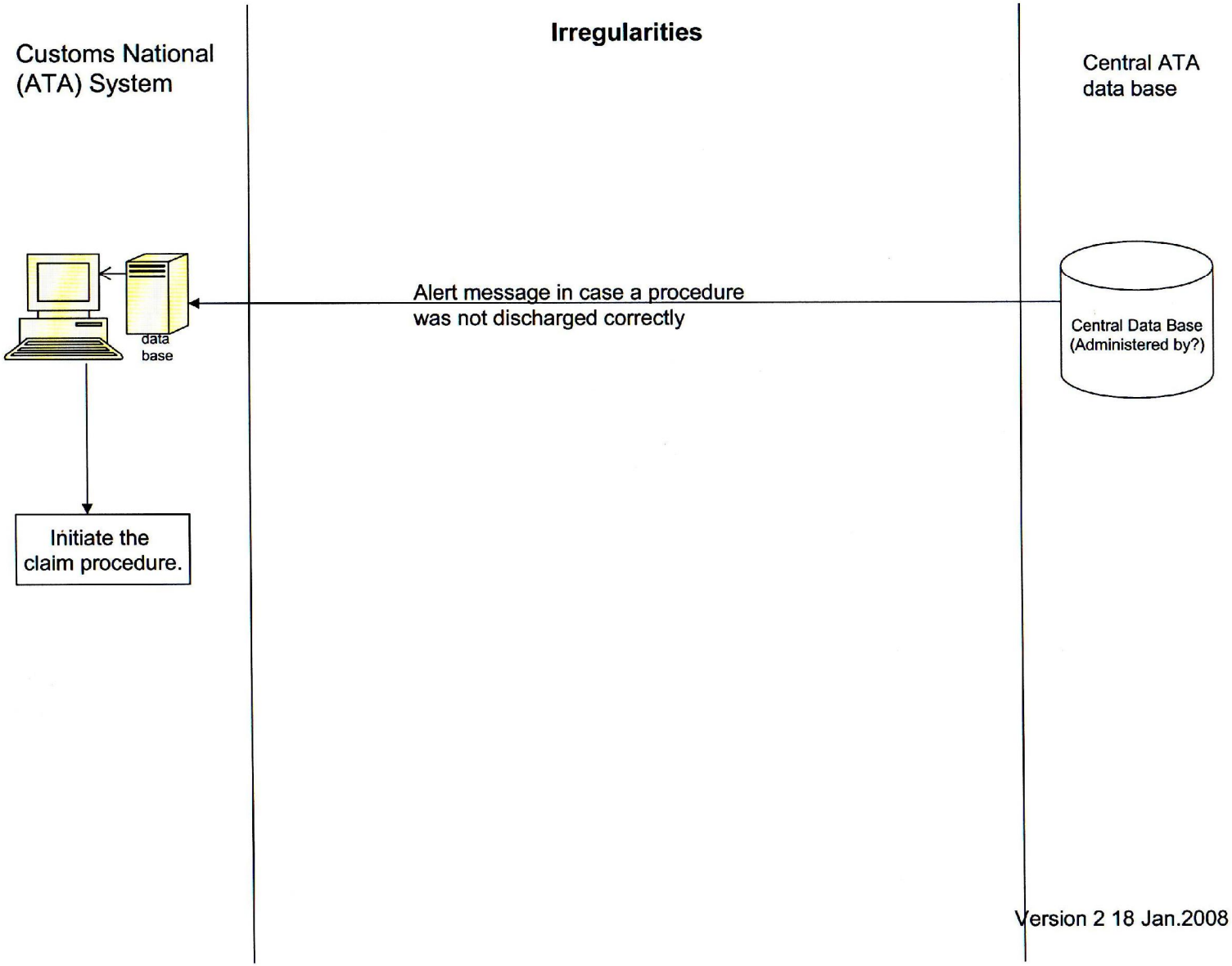

e-ATA issuing process
E-ATA Applicant * a
E-ATA Holder b
Chamber of Commerce / National Guaranteeing association
Chamber of Commerce / National Guaranteeing association
a Internet
a Or
Web site
a " receives"
Virtual ATA Carnet
a Completes
Virtual ATA Carnet
a Inform that virtual ATA is not OK
No
issue
a Inform that; virtual ATA is OK, the amount to pay
Yes
a Payment of the fees / provision of guarantee
Receive payment
a Inform that payment is not OK
No
Check
h Inform that; ATA is issued, the Carnet number, User name and Password
Yes
Virtual ATA Carnet Final status
Central Data Base (Administered by?)
h
Virtual ATA Carnet Read only
* The applicant should be well known / in the data base / address list of the CoC / Guaranteeing association
Version 2 18 Jan.2008



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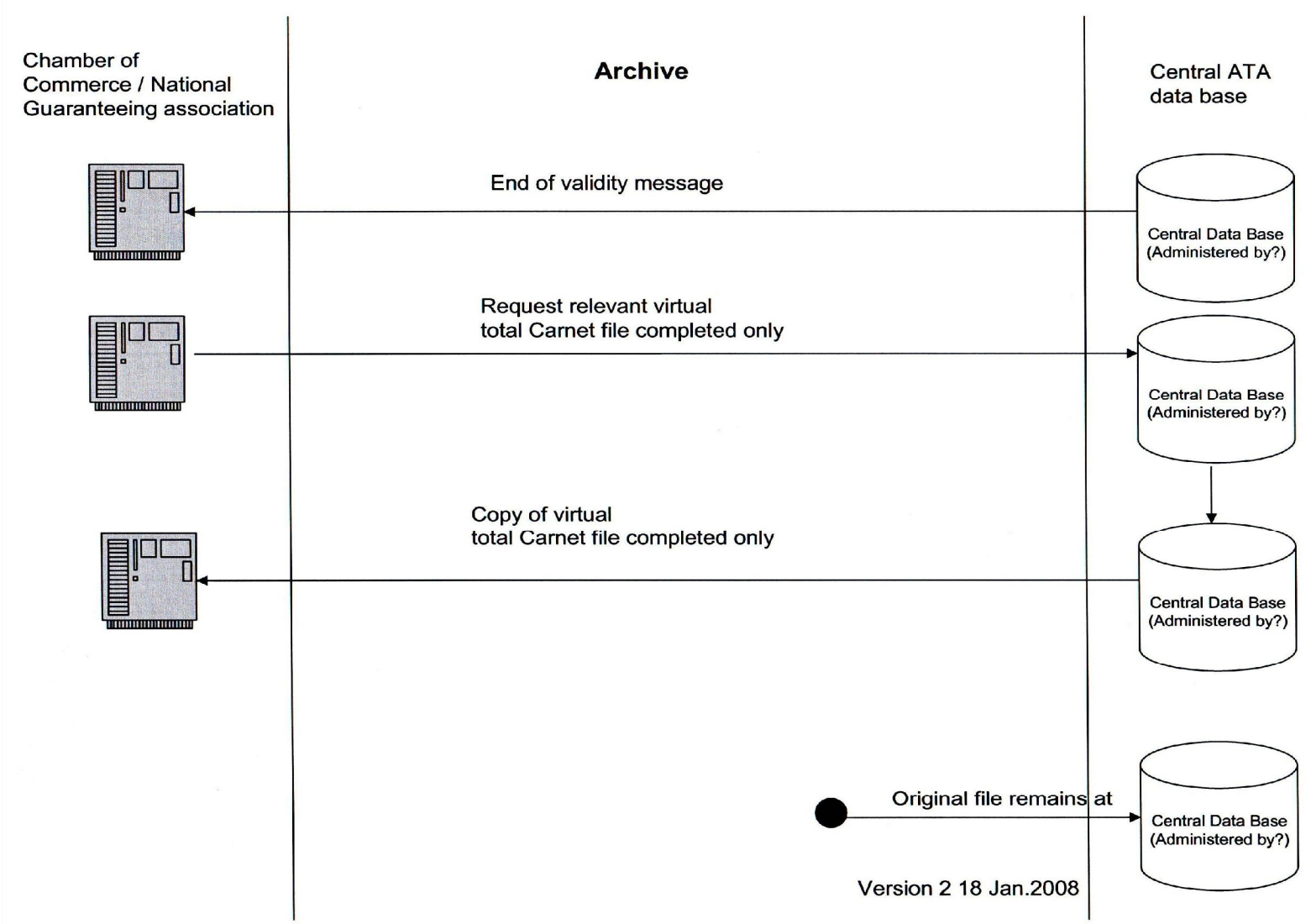
Chamber of
Commerce / National
Guaranteeing association
Archive
Central ATA
data base
End of validity message
Central Data Base
(Administered by?)
Request relevant virtual
total Carnet file completed only
Central Data Base
(Administered by?)
Copy of virtual
total Carnet file completed only
Central Data Base
(Administered by?)
Original file remains at
Central Data Base
(Administered by?)
Version 2 18 Jan.2008

Annex II to document PA0071E

OWNER:	ISSUE DATE:	VERSION:
DG TAXUD	11/05/2011	1.00-EN

TAXATION AND CUSTOMS UNION DG

CENTRALISED GLOBAL EATA CARNET SYSTEM

SUBJECT:

eATA Carnet: Final Report

(II_eATA_FINAL_RPT)

SERVICE CONTRACT TAXUD/2010/DE/318

EXCERPT

Disclaimer:

This document reflects solely the final report on the estimated costs of a centralised global eATA carnet system as produced and submitted by a company in the area of Information and Communication Technology services.

1.1. Abbreviation and acronyms

A list of the principal abbreviations and acronyms used is nonetheless provided here for a better understanding of this document:

ACRONYM	DEFINITION
ACL	Access Control Lists
BCC	Business Communication Channel
BPM	Business Process Model
BPMN	Business Process Modeling Notation
COSMIC FFP	Common Software Measurement International Consortium – Full Function Point
COTS	Commercial Off-The-Shelf (products)
DG TAXUD	Directorate-General Taxation and Customs Union
ESB	Enterprise Service Bus
EU	European Union
FAT	Functional Acceptance Testing
FPA	Function Points Analysis
FTP	File Transfer Protocol
FUR	Functional User Requirements
HTTP/S	HyperText Transfer Protocol/Secure
I/O	Input/Output
ICC	International Chamber of Commerce
IP	Internet Protocol address
JDBC	Java DataBase Connectivity (protocol)
LDAP	Lightway Directory Access Protocol
PQP	Project Quality Plan
QA	Quality Assurance
SAD	Systems Analysis and Design
SAN	Storage Area Network
SAT	Site Acceptance Testing
SLA	Service Level Agreement
SMTP	Simple Mail Transfer Protocol
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
SQI	Specific Quality Indicator
SSL	Secure Socket Layer
TbD	To Be Defined
TEMPO	TAXUD Electronic Management of Projects Online
TLS	Transport Layer Security
UTF	Unicode Transformation Format
V/LAN	Vitrual/Local Area Network
VAT	Value Added Tax

ACRONYM	DEFINITION
VM	Virtual Machine
VPN	Virtual Private Network
WCF	World Chambers Federation
WCO	World Customs Organisation
WP	Work Package
XML	eXtended Markup Language
XSD	XML Stylesheet Definition

Table 2-1: List of abbreviations and acronyms

2. eATA Technical Architecture

2.1. Definition of domains

The e-ATA system shall define three main domains. These include the External Domain, the National Domain and the Common Domain. These are presented in Figure 2-1.

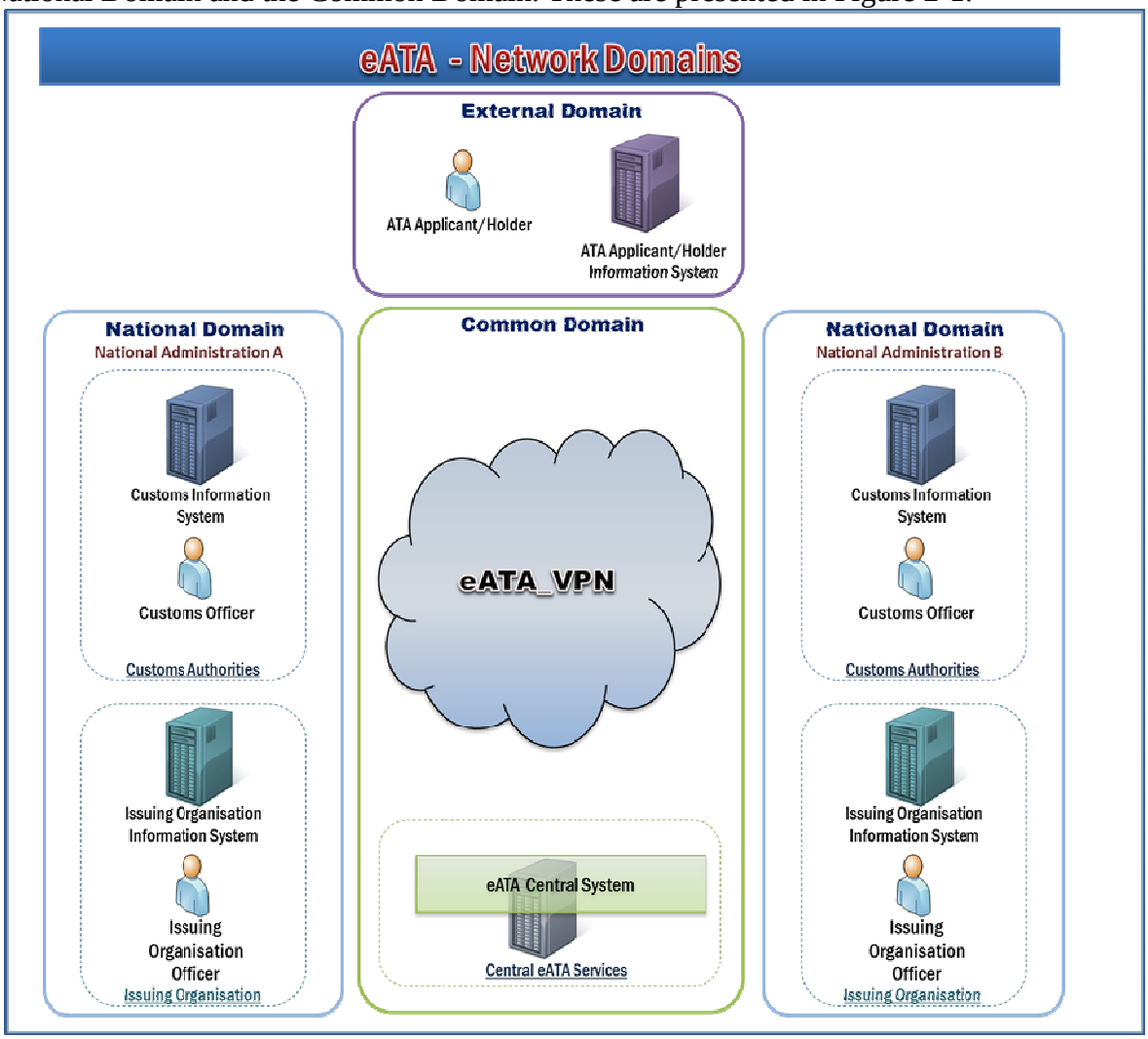

Figure 2-1: eATA Domains

2.1.1. External Domain

The External domain refers to the applicants and the trading community. The external domain also includes any infrastructure required in order for the applicants system (if any) to access the e-ATA centralized system or any other contracting party national system.

2.1.2. Common Domain

The common domain refers to the network used by all domains to communicate with each other and the processes performed between the different contracting parties and applicants with the central e-ATA system. The system components and infrastructure used to host the centralized e-ATA carnet system is covered in this domain.
In the scope of this study, this network is assumed to be the internet.

2.1.3. National Domain

The national domain represents both the customs administration and issuing organization of each of the contracting parties. The infrastructure and systems already in use by these organizations are covered in this domain.

2.2. Communication channels

2.2.1. Business Communication channels

Business Communication Channel	INTERACTION DETAILS	
Business Communication Channel - 01	**From**	**To**
	ATA Holder	**National Administration – Issuing Association**
	Description	
	This channel is used for the exchange of ATA Carnet data between the Issuing Association of the National Administration and the ATA Applicant/ Holder on the External Domain (ED). This BCC should be considered as bi-directional.	
Business Communication Channel - 02	**From**	**To**
	ATA Holder	**National Administration – Customs Offices and Authorities**
	Description	
	This channel is used for the exchange of ATA Carnet data between the Issuing Association of the National Administration and the ATA Applicant/ Holder on the External Domain (ED). This BCC should be considered as bi-directional.	
Business Communication Channel - 03	**From**	**To**
	National Administration – Issuing Organisation	**National Administration – Issuing Association**
	Description	
	This channel is used for the exchange of data between the Issuing	

	Associations of two different National Administrations. During the business process.

Table 2-1: Business Communication Channels

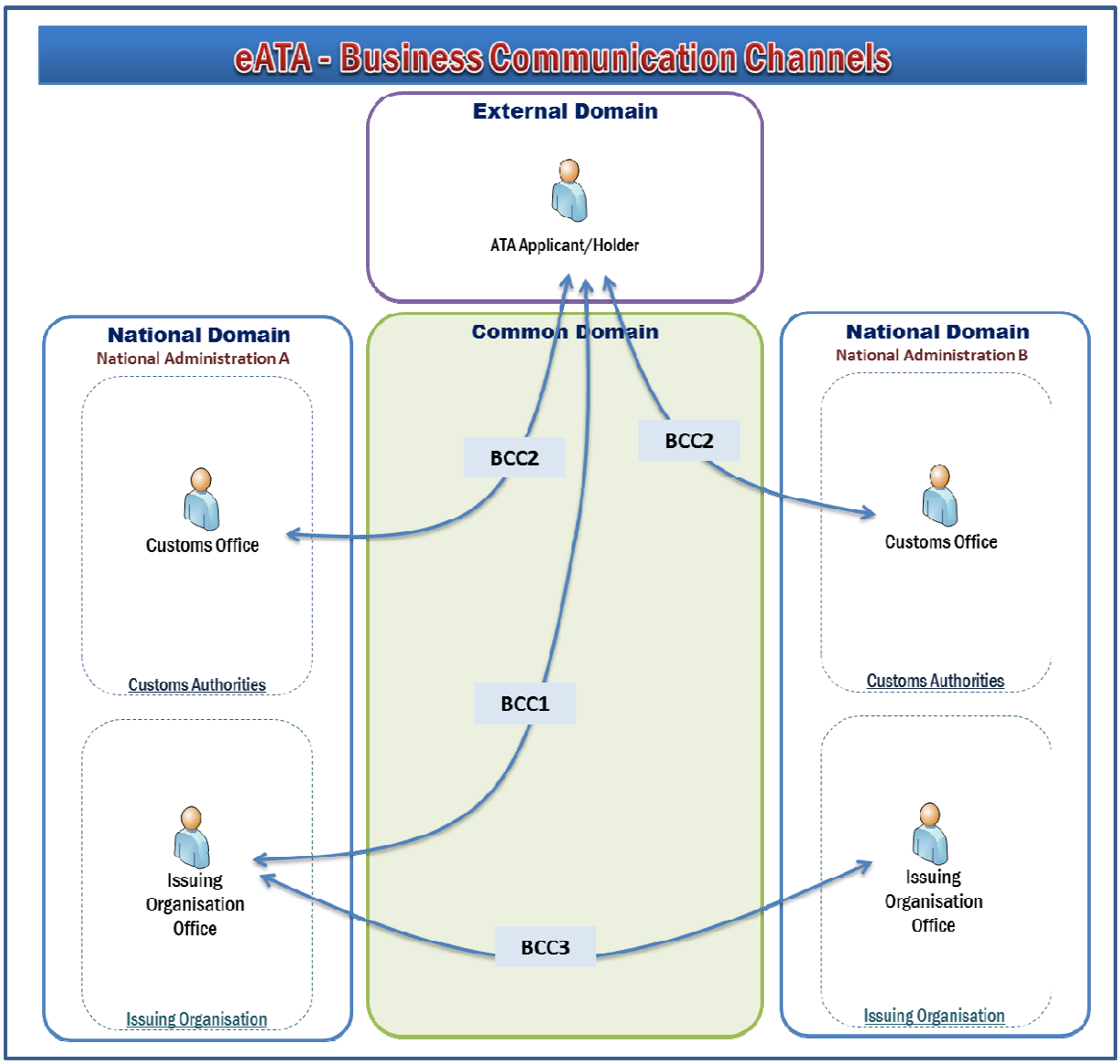

Figure 2-2: Overview of Business Communication Channels

2.2.2. Infrastructure Communication Channels

Communication Channel	From	To	Message Format	Type	Description	Direction	Optionality
Information Communication Channel - 01	ATA Applicant / Holder	eATA system	XML or CSV	FTP	ATA Holder uploading in the system ATA	Uni-directional	Optional

Communication Channel	From	To	Message Format	Type	Description	Direction	Optionality
					applications		
Information Communication Channel - 02	ATA Applicant / Holder	eATA system	N/A	HTTP/S	ATA Holder communicating with the eATA system	Bi-directional	Required
Information Communication Channel – 03	National Administration – Issuing Organisation	eATA system	N/A	HTTP/S	National Administration communicating with eATA system	Bi-directional	Required
Information Communication Channel – 04	National Administration – Customs Authorities	eATA system	N/A	HTTP/S	National Administration communicating with eATA system	Bi-directional	Required
Information Communication Channel - 05	ATA Applicant / Holder Information System	eATA system	XML	WS/SOAP	ATA Holder communicating with the eATA system	Uni-directional	Optional Alternative to ICC01 Additional to ICC01
Information Communication Channel - 06	National Administration – Issuing Organisation Information System	eATA system	XML	WS/SOAP	National Administration – Issuing Organisation communicating with eATA system	Uni-directional	Optional Additional to ICC03
Information Communication Channel – 07	National Administration – Customs Authorities Information System	eATA system	XML	WS/SOAP	National Administration communicating with eATA system	Uni-directional	Optional Additional to ICC04
Information Communication Channel – 08	eATA system	ATA Applicant / Holder Information System	N/A	SMTP	eATA system notifications to ATA Applicant / Holder	Uni-directional	Optional Additional to ICC02 (for notifications)

Communication Channel	From	To	Message Format	Type	Description	Direction	Optionality
Information Communication Channel – 09	eATA system	National Administration – Issuing Organisation Information System	N/A	SMTP	eATA system notifications to National Administration – Issuing Organisation	Uni-directional	Optional Additional to ICC03 (for notifications)
Information Communication Channel – 10	eATA system	National Administration – Customs Authorities	N/A	SMTP	eATA system notifications to National Administration – Customs Authorities	Uni-directional	Optional Additional to ICC04 (for notifications)

Table 2-2: Information Communication Channels

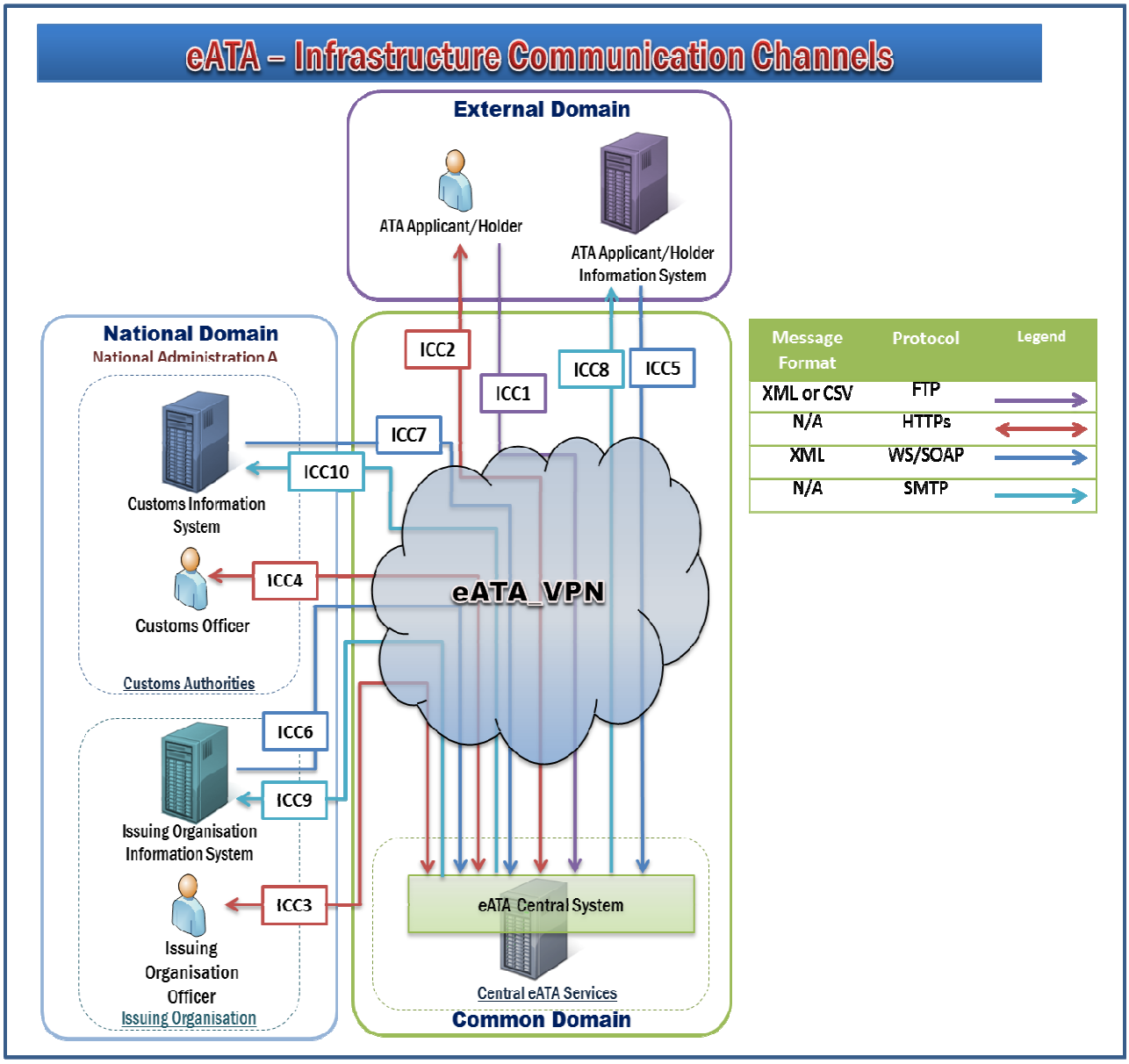

Figure 2-3: Overview of Infrastructure Communication Channels

In order to effectively cost estimate the e-ATA Carnet system, a high level technical architecture has to be specified. In this section the proposed technical architecture will be presented both on a network topology level covering key hosting facilities and system application level describing the application architecture.

2.3. Network Topology – Hosting Alternatives

Due to the global nature of the service, with access requirements spanning several continents, the e-ATA system should be hosted on an environment which is easily reachable from anywhere in the world, with excellent performance. Due to this requirement it is advised that

the hosting environment is outsourced onto a Tier-1 internet provider, in order to achieve better accessibility throughout the internet. Moreover, it is of major importance that the collocation datacenter(s) is no less than Tier-3 certified.

2.3.1. Hosting infrastructure

Usually the collocation datacenter providers can supply the required hardware for efficiently running the application. Else, this hardware can be installed on the collocation datacenter with the collocation provider charging just for rack space and bandwidth. In any case, an example hardware configuration for efficiently running the e-ATA application may look like the following provided that the collocation datacenter will only offer rack space and internet connectivity.

2.3.1.1. OPTION A: Equipment Collocated on a Tier-1 Provider Datacenter

2.3.1.1.1. Servers and Storage

The e-ATA system would be hosted on 2 virtual machines, one running the application and the second running the database. The two virtual machines reside on one physical server with a fiber channel connection onto a Storage Area Network (SAN). The physical server is running a hypervisor operating system and the data store of that o/s is running from the SAN. The whole infrastructure is connected onto a local area network, while using 2 redundant internet lines, the speed of which has to be determined according to demand.
The application servers do not post the application directly on the internet, as all incoming traffic is filtered through a cluster of reverse proxy servers. At the network layer, protection is assured by a pair of firewalls (highly available configuration).
Taking into account expandability needs, as well as high availability and performance factors, it is advised to run the applications on Blade servers. Regardless of the hardware platform (RISK, SPARC, x86, etc.) blade servers provide high I/O capabilities on a small form factor. A typical example is shown in Figure 2-4.

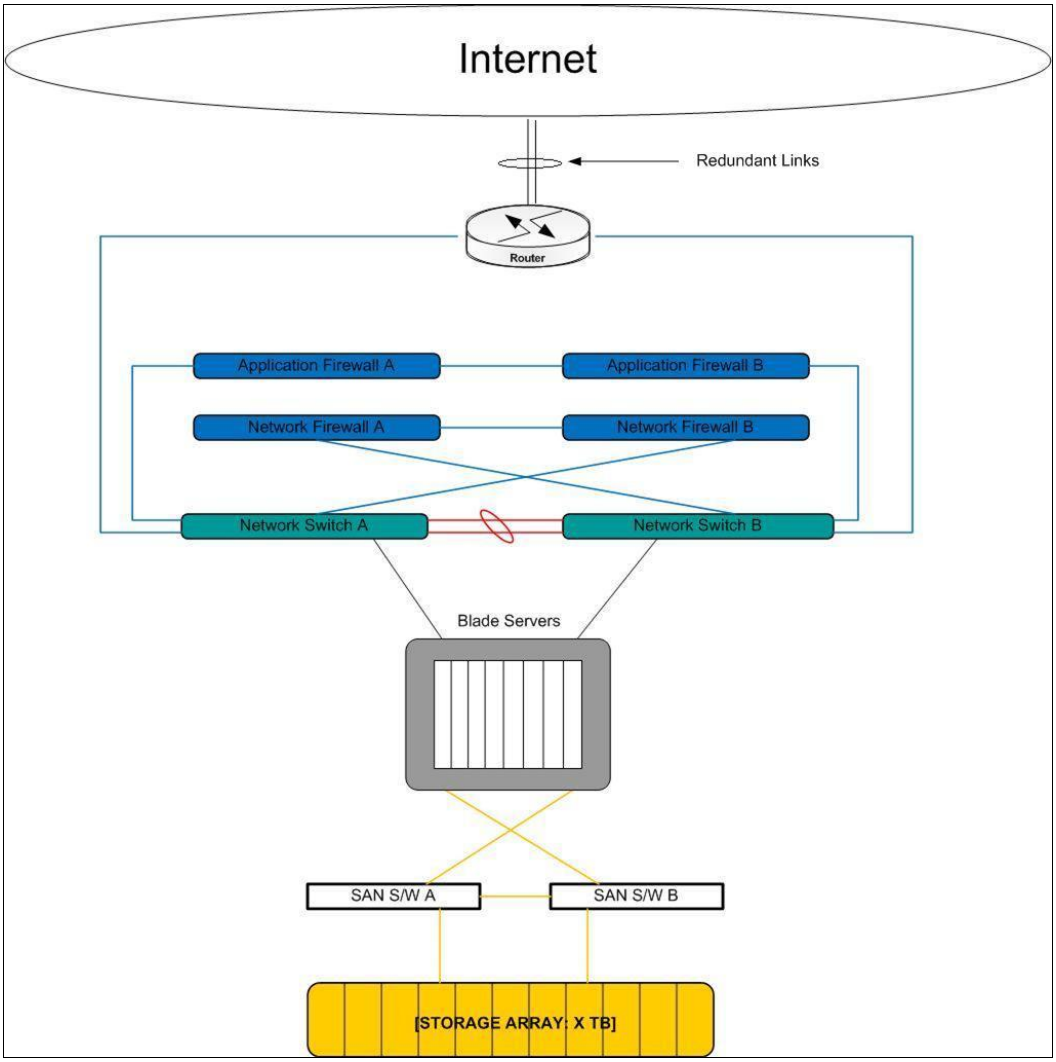

Figure 2-4: The Blade Center Configuration

This configuration can deliver high availability at the datacenter level, along with enterprise class expandability and performance capabilities.
A typical setup could be as follows:

- 2 Blade servers running VMware ESX Server 4.0, each of which running the necessary number of virtual machines for hosting the application. Vmware's vmotion feature is used in order to control the failover from one system to another in case of failure or unexpected loads.
- 2 Blade servers running VMware ESX Server 4.0, each of which running the DB application. VMware's vmotion feature is used in order to control the failover from one system to another in case of failure or unexpected loads.
- Each blade server can be equipped with up to 128 GB of RAM
- One Blade server can be used in order to run the VMware V-Center management platform (on Windows server 2008)
- All systems are connected onto the Storage System through FC connections at 8 Gbps.

The capacity of the storage system may vary depending on the needs, however full online expandability for the VMware file system are support.

Application configuration alternatives may affect the hardware configuration, as well as the storage systems software options. Moreover, the setup of the SAN can be done also in many ways and is subject to the hosting needs. The setup described above is only a very general outline of the suggested architecture and is subject to the type of hosts that will connect to it. The same principles apply for the network and security appliances.

2.3.1.1.2. Network

The network fabric may vary depending on the features one may require. At least 2 network switches (see Figure 2-4) should be used in order to provide for high availability for the blade servers, whereas interface boning should also be utilized in order to provide 2 GBps LAN speed for the blades.

The firewall appliances should be configured on a cluster mode in order to provide for high availability. Gigabit interfaces should however be used in order to be able to apply inter – VLAN policies in case the configuration of the whole information system requires such speeds.

Link speed is subject to application utilization however the internet lines used should be dynamically expandable, while providing in parallel for a fail over circuit using alternate physical routes (or multiple failover circuits)

Advantages

- Full control of configuration and setup.
- Well defined SLA.
- Better control on application and system monitoring.

Disadvantages

- Resources elasticity: Throughput, as well as memory, I/O and link speeds are limited to the initial sizing.
- Initial Hardware and Software cost.

2.3.1.2. OPTION B: Services Provided on a Public Cloud

Cloud computing continues to dominate the discourse at every level of the IT industry, and the cloud concept is gaining increased visibility with mainstream business leaders and even consumers.

In data-centers, dramatic improvements in performance and packaging of server hardware, along with the rise of virtualization technology, have made computing capacity more easily accessible, and at more attractive costs, than ever before. At the same time, the rise of ubiquitous broadband has increased end-user expectations for anywhere access to applications and computing activities.

The confluence of these trends makes it clear that the emergence of cloud computing will represent a major transition for IT in general, with a far-reaching effect on the way that computing is installed and used.

After some period of debate about cloud terminology and categorization, the concept of cloud computing is now becoming better defined, as users come to terms with its practical application and benefits in real-world environments.
The priority for most organizations at present is to virtualize as much as of their internal infrastructure as possible. Indeed, for many users (especially in large organizations) the term "cloud" largely implies converging virtualized server, storage, and network resources into a single pool that workloads can draw upon as needed, while also affording some degree of self-service and better accounting of the resources consumed by users and workloads.

Cloud computing is generally associated with virtualization. Most definitions of cloud computing cover approaches such as Software as a Service (SaaS) and Platform as a Service (PaaS), which do not necessarily depend on virtualization.

Virtualization provides a powerful means to adapt existing infrastructure and applications for achieving the benefits of cloud computing in the form of Infrastructure as a Service (IaaS).

SaaS	The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure and accessible from various client devices through a thin client interface such as a Web browser (e.g., web-based email). The consumer does not manage or control the underlying cloud infrastructure, network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
PaaS	The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created applications using programming languages and tools supported by the provider (e.g., java, python, .Net). The consumer does not manage or control the underlying cloud infrastructure, network, servers, operating systems, or storage, but the consumer has control over the deployed applications and possibly application hosting environment configurations.
IaaS	The capability provided to the consumer is to rent processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications, and possibly select networking components (e.g., firewalls, load balancers).

Table 2-3: Cloud Computing Service Alternatives

The relevant definition of US National Institute of Standards and Technologies are reported in the previous table.
There is also a spectrum of deployment options for cloud computing spanning from private to public cloud through hybrid models, as it is described in the following picture.

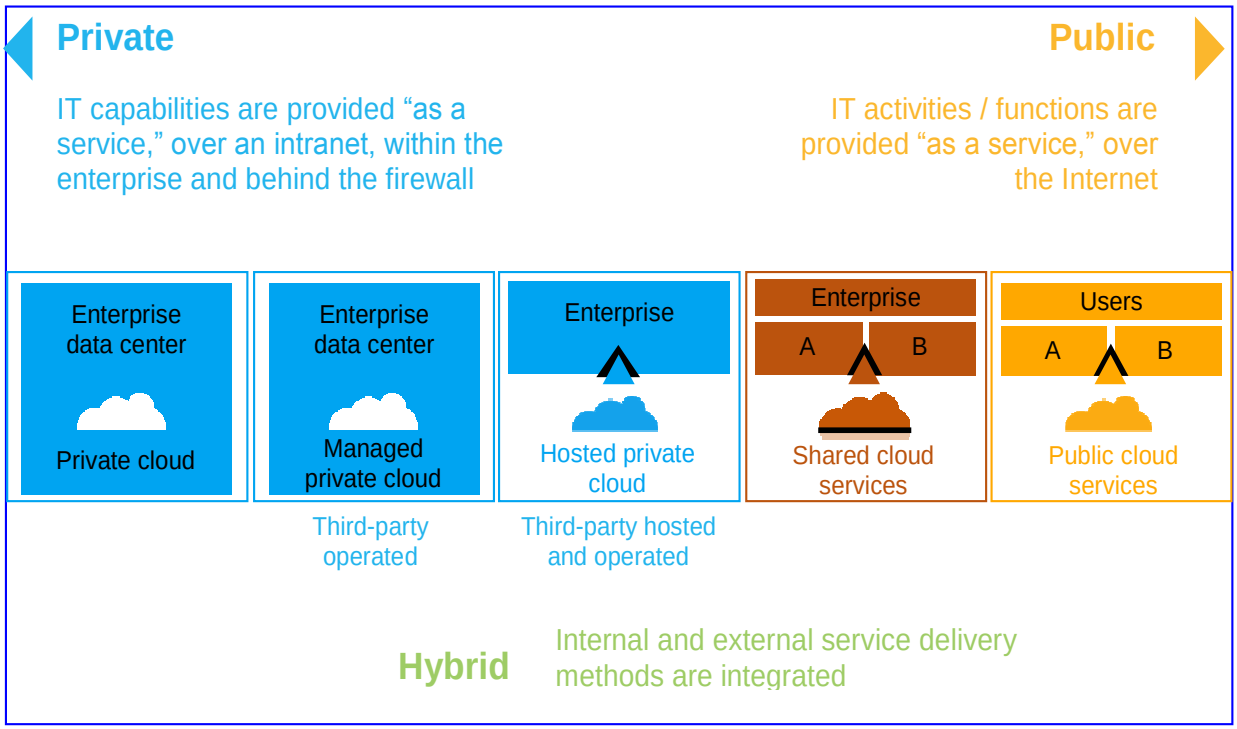

Figure 2-5: Deployment options

There is a variety of ways to implement clouds, which usually involve coupling virtualization with management frameworks that are optimized for pooling virtual resources. Clouds typically also provide some form of self-service provisioning, whereby users select the services they need, after which the virtualized back-end resources needed to host the services are automatically assembled.

Hence, success with clouds depends on adopting all the following operational practices for managing virtualized systems:

» Consolidation and virtualization. Workloads are rehosted as system images in virtual machines, which are deployed on servers equipped with robust virtualization capabilities. These virtual machines can be securely stacked on physical hardware, allowing computing resources to be assigned to workloads with far greater precision, which leads to better utilization of servers.

» Standardization of the system images in which cloud-based services will be hosted. The relative ease of creating virtual machines significantly increases the challenge of provisioning those virtual machines with software that makes them useful for production workloads. At the same time, with virtualization, users have more variables than ever to consider for matching an application workload with the resources needed to host it. Within virtual machines, a particular application or its users will dictate the installation of specific operating systems, all of which may draw on a steady stream of updates and patches. Administrators of clouds therefore should exercise discipline in maintaining a relatively small number of system images in libraries based on standard, open formats that can be browsed in a service catalogue.

Ideally, the number of these images should be limited to dozens or hundreds, rather than the thousands of images that administrators might contend with in the traditional physical infrastructure found in enterprise environments.
» Lifecycle management is a critical part of the provisioning process in virtualized environments. Tracking and properly installing software updates represents a significant share of administrative overhead, and this burden can be magnified as the number of virtual machines increases or fluctuates in private cloud environments. Without disciplined lifecycle management, clouds will simply become virtual replicas of traditional unwieldy physical infrastructure, making it difficult to achieve the economic promises of cloud computing.

» Monitoring internal consumption of resources by user or workload will also be important to achieving the economic benefits of clouds. By adopting disciplined measurement of resource consumption, administrators can implement chargeback processes, which may be coupled with self-service interfaces so that users can make informed decisions about the costs of instantiating services. Deeper accounting of computing resources will allow managers to more precisely compare the costs of external versus internal resources.

» Automation: provisioning, lifecycle management, and monitoring should be accomplished behind the scenes, with as little operator intervention as possible, so that users can have the flexibility to initiate and terminate services at will.
Once these practices are put into place, so implementing a cloud management infrastructure similar to those in Figure 2-6, it becomes possible to implement service catalogues that can be reliably invoked by users.

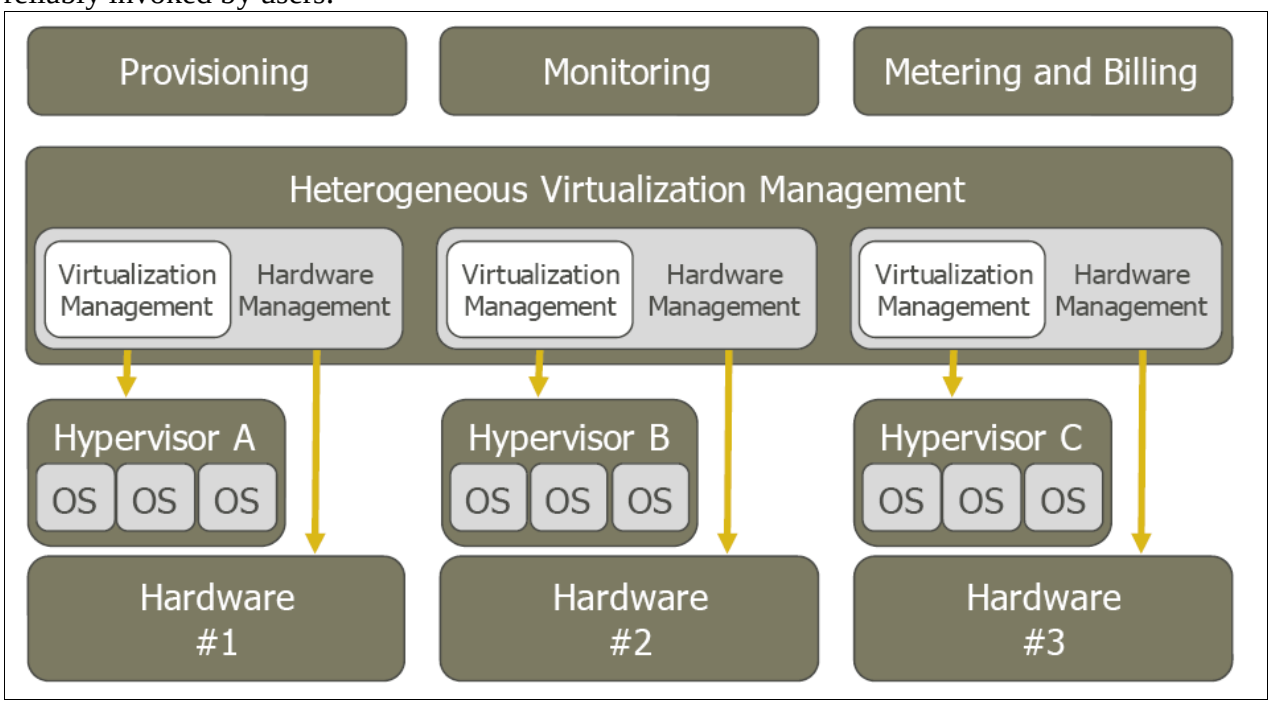

Figure 2-6: Management infrastructure alternatives

Tier-1 internet providers, as well as hosting companies and hardware vendors can provide a complete environment in the form of IaaS (infrastructure as a Service). In this scenario, the

services of the e-ATA application can be delivered through such infrastructures, with the following advantages and disadvantages.

Advantages

- Resources elasticity: Throughput, as well as memory, I/O and link speeds can be automatically adjusted to service the needs.
- No need to get involved in the procurement of hardware and licenses.
- Better global access.
- Well defined SLA.
- Application monitoring.

Disadvantages

- Less control over the overall information system.
- Possibly less flexibility on what cloud services can currently offer (applies to complex information systems).
- Complex Lifecycle Management.

3. Cost Analysis

The estimated cost of the global e-ATA Carnet System includes the following:

- Implementation Costs
- Operation Costs
- Maintenance Costs
- Help desk Costs

3.1. Implementation Costs

The cost for implementing the global e-ATA carnet system has been estimated using the Function Point Analysis method. The cost includes the production of the following:

- **e-ATA System Specifications**
  - Project Quality Plan
  - Inception Report
  - Detailed Application Specifications Document
  - Detailed Technical Specifications Document
  - Detailed Security Specifications Document
  - Detailed Interoperability Specifications
  - Acceptance Test Scenarios Document
- **e-ATA System Design**
  - Service Model
  - Data Model
  - Detailed Design Document
- **e-ATA System Development**
  - Coding
  - Unit Testing
  - e-ATA Installation Document
  - e-ATA Administration and Configuration Document
  - e-ATA User Manual
  - e-ATA External Interface Document
- **e-ATA Factory Acceptance Testing**
  - Creation of Test Plan
  - Factory Test Execution
  - Factory Acceptance Test Report

Proposal Description	Minimum Cost (€)	Maximum Cost (€)
Proposal 1: Minimum business scope implementation. Only covers mandatory business requirements. Only Web Client interface is provided. Web Service and FTP interface limited to e-ATA application submission. No interfacing with national systems (customs and issuing	**750,000.00**	**1,200,000.00**

Proposal Description	Minimum Cost (€)	Maximum Cost (€)
associations)		
Proposal 2: Maximum business scope implementation. Only Web Client interface is provided. Web Service and FTP interface limited to e-ATA application submission. No interfacing with national systems (customs and issuing associations).	**900,000.00**	**1,350,000.00**
Proposal 3: Same as Proposal 2 and in addition full WEB Service (and FTP) interface services provided to all stakeholders. Message support for all e-ATA system functionality.	**1,150,000.00**	**1,500,000.00**

3.1.1. Maintenance Costs

The maintenance of all e-ATA system items will be estimated. This includes all system documentation and deliverables. The maintenance will be estimated on a yearly basis and will only cover corrective maintenance.

Proposal Description	Minimum yearly Cost (€)	Maximum Yearly Cost (€)
Implementation Proposal 1 Maintenance Cost	**110,000.00**	**150,000.00**
Implementation Proposal 2 Maintenance Cost	**130,000.00**	**180,000.00**
Implementation Proposal 3 Maintenance Cost	**170,000.00**	**230,000.00**

3.2. Operation Costs – OPTION A

Operation costs of the global e-ATA carnet system include:

- **Hardware**
  - Production Environment
  - Backup and Recovery
  - Testing Environment
  - Training Environment
  - Network equipment and devices
- **Commercial off-the shelf Software/Licenses (COTS)**
  - Application Server
  - Database Software
  - Operating System Software
  - Others
- **Hosting Costs**
  - Data Center
  - Disaster & Recovery Site
- **e-ATA Network Service Cost (Internet Cost)**

Proposal Description	Minimum Cost (€)	Maximum Cost (€)
Option A: Central Location	**520,000.00**	**1,770,000.00**
➢ Hardware Requirements Servers and Storage (Production, Backup, Fallback-equivalent to 4 Blade quad cores)	240,000.00	400,000.00
➢ Hardware Requirements Servers and Storage (Training, Test – equivalent to 1 Blade with multiple VM environments)	50,000.00	80,000.00
➢ COTS (For all environments)[1]	200,000.00	1,200,000.00
➢ Network Infrastructure	30, 000.00	90,000.00

The above hardware costs can be reduced if more than one environment is hosted on the same hardware (for example test and training). The maintenance costs for this proposal are presented below.

Proposal Description	Minimum yearly Cost (€)	Maximum Yearly Cost (€)
Option A: Central Location	**70,000.00**	**180,000.00**
➢ Hardware Maintenance Cost	10,000.00	15,000.00
➢ COTS Maintenance Cost	20,000.00	60,000.00
➢ Hosting Costs	5,000.00	15,000.00
➢ Internet Lines Costs ~50Mbps (with redundancy-fallback)	20,000.00	50,000.00
➢ Off-Site Hosting[2] (Disaster/Recovery)	5,000.00	15,000.00
➢ Off-Site Internet Lines Costs ~25Mbps (with redundancy-fallback)	10,000.00	25,000.00

3.3. Operation Costs – OPTION B

For Infrastructure as a Service (IaaS), Cloud provider is not the software license owner and full price licensee is assumed. Similarly for Platform as a Service (PaaS) and Software as a Service (SaS), Cloud provider is not the software license owner. The cost shown in the table below.

[1] If open source COTS are used, the minimum cost is zero.
[2] This is optional. For fall back high availability reasons, it is no necessary for separate hosting site.

Option B: Cloud Computing	Infrastructure as a Service (IaaS)	Platform as a Service (PaaS) / Software as a Service (Saa) Discounted (50%) price licence, three years depreciation and 25% mark-up assumed
Cost of Licence (€)	1,200,000	200,000 (yearly rate)
Markup		50,000
Cloud Yearly Fee (€)	60,000 (yearly rate)	60,000 (yearly rate)
TOTAL	**1,260,000 (first year)**	**310,000 (yearly rate)**

3.4. Helpdesk Costs

A Help Desk is foreseen for both business and technical related assistance 24 hours a day 7 days a week due to the global nature of the e-ATA system. This may require that different help desks are setup at different continents or even at the different contracting countries.

In the scope of this study it will be assumed that a central help desk will be available providing technical and functional assistance to users with the following specifications:

- Live assistance in 5 languages for 24x7 via phone, instant message or email
- Offline assistance in other languages with a 3 days resolution time threshold
- 3 shifts will be required per 24 hours
- 4 people will be available for at the same time for each shift in order to cover the 5 languages

Proposal Description	Minimum yearly Cost (€)	Maximum Yearly Cost (€)
Help Desk Services	**900,000.00**	**1,300,000.00**

The above assume European person day costs. The above costs can be reduced by:

- Reducing the number of supported languages at any one time;
- Reducing the number of persons available for each shift;
- The member states/contracting parties providing part of the service desk support (business/functional service desk support).

******* End of document*******