Annex 12

Technical Environment and Standard Operating Procedures of the Publications Office

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1 Purpose of the Document

This document provides an overview of the technical environment of the Publications Office as well as some general rules linked to the technical organisation of the Publications Office and applicable to all applications hosted at the Publications Office.

2 Disclaimer

The information contained in this document reflects the situation in force at the Publications Office at the time of writing and is subject to change.

The Publications Office can not be held liable for the consequences of any reliance on the information provided or for any inaccuracies in such information and it does not commit the Publications Office regarding the future evolution of its data processing and network environment.

The content of this document may vary in relation to any particular project. In particular, the environment to take into consideration for a specific project/purchase order – especially the exact software versions – will be determined at the very beginning of the project. This also includes the rules to apply by both parties in order to modify this environment.

The Publications Office strongly advises the contractor to ask for clarification should there be any doubt about the contents of this document. If requested by the contractor, a meeting can take place at the very beginning of the project to answer questions and provide examples of the expected documents.
3 Technical Environment of the Publications Office

3.1 Introduction

The Publications Office makes a distinction between systems used for office automation and administrative information systems on the one hand and systems used for production on the other hand. The quality of service and the constraints of availability are tighter for the production systems, since external partners with contractual agreements are already in place. Another important difference between these two types of information systems is linked to their architecture. The production information systems are usually spread over several servers and include complex production chains with processing on all nodes, whereas administrative and office automation systems are simpler and frequently use a one-to-many relationship between a server and its clients.

However, the same basic infrastructure is made available for both types of information systems, as described hereafter.

3.2 Application Architecture

The hardware and software architecture to use within a project is generally proposed by the contractor and should be compatible with industry best practices and the technical environment described in this document. This architecture has to be validated by the Publications Office before implementation.

For the design of this architecture, the contractor has to take the following aspects into consideration:

The Publications Office has deployed a DRP (Disaster Recovery Plan) which makes use of two different geographical sites and is based on the following principles:

- The DRP conforms to the Contingency Plan of the Publications Office
- The data replication between the two sites is synchronous
- Both sites are hosting "active" applications

UNIX is the recommended environment for production systems while office automation systems are normally hosted on Windows servers.

The Publications Office fosters professional methods of managing systems and therefore implements monitoring and measuring tools for systems and produces statistics on the use of computing resources and on the quality of service provided.

The Publications Office promotes the implementation of a three-tier architecture, using thin clients, application servers and mainly Oracle databases for reasons of performance, scalability and flexibility.

3.3 Data Exchange

In general, application processes exchange data either by mail or by FTP using a dedicated and in-house developed proprietary tool (WOOD – Worldwide Object Dispatcher).

Besides the exchange of data (files) between processes – possibly running on distinct servers – this tool allows the triggering of processes based on the arrival of a file in a predefined directory. The tool is written in Perl and uses normally FTP as underlying protocol but could theoretically use whatever standard file transfer protocol (e.g. scp). Due to the asynchronous character of this tool, the WOOD cannot guarantee the order of files exchanged. If sequencing is an issue, it must be managed at application level.
The Publications Office strongly advises the contractor to ask for practical implementation guidelines before starting any development that could require integration/interaction with the WOOD. Contractors are also supposed to take care not to use reserved characters in file names.

Direct dependencies between servers (e.g. NFS mounts, database links, ...) are generally prohibited.

### 3.4 Security Provisions

A separate document describing the OP Minimum Security Requirements is attached to each Call for Tender for information processing system and/or services issued by the Publications Office. Any application, system or service that is introduced at the Publications Office has to comply with these requirements.

### 3.5 Other Provisions

The Publications Office promotes the virtualisation of services and the use of abstraction layers in order to increase flexibility. This implies in particular that:

- web-based applications must allow the deployment and the correct operation behind any http reverse proxy chain.
- applications must allow virtual hosting i.e. the binding of the application to only some of the IP addresses/hostnames of a multi-homed server
- applications must allow easy integration in the DRP of the Publications Office
- applications must be compatible with an MS Windows 2003/2008 terminal server architecture
- if the application depends on network services like DNS or LDAP, the server name or the IP address should not be hard-coded but should remain configurable

Before being put into production, all of the Publications Office’s core business applications, which are often interdependent, are tested for incompatibilities on dedicated machines.

Authentication mechanisms must use the available centralised directory server infrastructure (ECAS server of the Commission – AD server of the Publications Office - …)

Data archiving and purging mechanisms have to be foreseen and implemented so that data volume growth does not degrade application performance nor backup/restore operations.

On the hardware side, the technical data processing infrastructure is currently made of several components that can be grouped into the following categories:

- Network and telecommunications
- Storage, backup and archiving systems
- Workstations and peripherals
- UNIX servers
- Windows servers

Details on these categories can be found in the relevant sections later in this document.
4 Network and Telecommunications

The Publications Office’s staff is spread over several buildings. The Wide Area Network use leased lines, either over dark fiber high speed connections or connections to PSTN. The Publications Office’s buildings use a common cabling system for the telephone as well as for the TCP/IP network for data. This structured cabling system uses copper connections category 5 (or higher) to desktop computers and high-end servers with a throughput of up to 10 Gbps and optical fiber connections for the backbone. Both networks deal with about 1 000 telephones and more than 1 500 Ethernet devices, and will continue to grow with potential new sites.

In particular, connections with the contractors working for the Publications Office use leased lines or the EURO ISDN network for lower speed data transmission. The ISDN
dialup service is in many installations serving as a backup solution for the leased line connection.

The most common application for the Publications Office remote access service is file transfer (FTP). Files are transferred via a FTP gateway installed in the Office DMZ.

The TCP/IP network is also interconnected with the network of the European Commission that is connected to the Internet and to the sTESTA network (Trans-European Services for Telematics between Administrations). The sTESTA network allows the Publications Office to establish private connections with most of the national Administrations of the EU Member States and most of the EU Institutions. FTPStore is a service offered by DIGIT/Commission for sending and receiving files over the public Internet or via the sTESTA network. FTPStore is not offering any notification or monitoring of file movements.

All accesses that make use of the network of the European Commission (e.g. Internet accesses) have to comply with the general security rules of the Commission. This also implies that all mentioned networks are interconnected through stateful inspection firewalls. In particular, outbound direct internet access is NOT allowed. Applications that require internet access have to be "proxy aware". Fax services are carried out by redundant Windows servers and are part of the automatic production chains in the daily publishing process. The Publications Office has reached a high level of integration of telephone and IP-messaging services.
5 Storage, Backup and Archiving Systems

5.1 Storage

The Publications Office application data is centralised on SAN/NAS storage arrays for production/test systems,

For disaster recovery purposes data is online replicated in two Data Centres. On SOLARIS Cluster platforms the method for replicating the data is Host Mirroring. For Windows, Linux and VMWARE platforms Storage mirroring (synchronous) is implemented. The Storage Area Network is available in both Data Centres and all servers are configured in two separate Fabrics. The Inter building links use DWDM communication channels.

About 150 Terabytes of online storage capacity is available to end-users and applications. This amount is steadily growing due to the increased usage of electronic documents in the Publications Office; the increase rate is about 30% per year.

It's the aim to implement and realise a hierarchical storage management policy and infrastructure matching the Publications Office’s business data requirements.

5.2 Backup: General Principles

The backup and restore service is built upon EMC LEGATO NETWORKER family software. The architecture is designed to be redundant between both Data Centres, using cloning technologies. To optimise the load on the backup servers, additional dedicated servers acting as storage nodes are in place. To enhance backup/restore performance, backup is done on disk in Virtual DEDUP Tape Libraries. The current backup policy and procedures are described in the next section.

5.3 Backup: Current Policy and Procedures

5.3.1 Categories of Backup Jobs

The following backup jobs are distinguished:

- Full backup: backup of all data.
- Level backup (differential backup): backup of all data changes since the last lower level backup (full backup corresponds to level 0). Only one level is currently defined. Thus, level backups are always performed with respect to a full backup.
- Incremental backup: backup of data changed since the last backup, independently of its type.

5.3.2 Backup Policy

- The jobs are scheduled between 8 p.m. and 2:30 a.m. The effective backup might start only after the scheduled pre-processing jobs (e.g. database snapshot) have been finished.
- Full backup jobs are generally run once per week and are distributed between all days of the week.
- Level jobs (i.e. differential jobs) are run 4 times per week between Monday and Friday every day the full backup job is NOT run.
- Incremental jobs are run once a day, except the day of full backup.
- The browse policy (direct access to file and directory information of the backed up file systems) and the retention policy are generally set to 3 months. The
retention period on the virtual tapes is 1/3 of the retention period of all physical production tapes. The retention period for all test/development data sets is 30 days, online.

- After retention period expiration all virtual/physical tapes are recycled
- Software compression is used on the client.
- Hardware compression is used at tape device level.
- No separation is made between full, level (differential) and incremental job tapes.
- The backup tapes remain in the tape library. The reusability of these tapes is controlled by the software.
- The virtual/physical tapes are cloned.
- Backed up/Cloned tapes are removed regularly by the computer centre operators and placed in the safe.
- The backup software provides appropriate features to assure that the data of a tape volume can be safely overwritten.

5.3.3 Backup of Oracle Databases

One or a combination of the following techniques is used:

- **Logical database backup:** Oracle export dump files are generated while the database is in restricted access mode. These files are written on the file system of the corresponding servers. The database is then stopped and backups of the server file systems are made within the global backup framework.
- **Physical cold backup:** The database is stopped and backups of the server file systems are made within the global backup framework.
- **Physical hot backup:** An open database backup is done
- **RMAN (Oracle recovery manager):** All standard features of RMAN are used.
- **"Freeze"/Snapshot techniques:** In order to limit the unavailability of the database during the physical cold backup, the database is stopped only during the time needed to make a "freeze" or a snapshot of the file systems hosting the database. The "freeze" or the snapshot is then available for tape backup or for restore purposes.
  - A **snapshot** consists in attaching an additional mirror volume for the desired directories and to make a synchronisation between the additional mirror and the mirrored volume.
  - A **"Freeze"** consists in keeping the state of a file system at the given “Freeze" time by means of a second file system with exactly the same directory structure. Prior to any modification of the "frozen" file system, the unmodified data is copied to the second file system. By combining both file systems, the “Frozen” state is always available.

5.3.4 Backup Implementation

It is the responsibility of the Publications Office to define the objectives to reach in terms of availability/unavailability of the application.

Based on these requirements, the contractor must define the backup procedures to implement in order to fulfil the requirements. Ideally, the contractor must base these backup procedures on techniques the Publications Office’s staff is familiar with (see contents of this appendix).

If the wishes of the Publications Office in terms of availability cannot be satisfied with techniques the Publications Office’s staffs is familiar with, the contractor must provide
a full description of the procedures and techniques to use so that the implementation by the Publications Office’s staff could happen smoothly.

5.4 Archiving: General Principles

Within the objective to reduce costs and to create a tiered data protection regime, data which is not modified often is archived out of the primary storage arrays.

Archiving policies are in place for File and E-mail services. The archiving system is moving the target data towards dedicated archiving storage arrays. For disaster recovery purpose the archived data is replicated between both Data Centres.

In the future, the Publications Office will expand its archiving strategy for in-house developed application datasets.

5.5 Archiving: Current Policy and Procedures

5.5.1 Categories of Archive Jobs

The following archive jobs are distinguished:

- On demand: archiving data in specific pools with retention periods of 5, 10, 15 years and beyond
- Scheduled: e-mail /file service monthly policies
- Incremental: user administrators can post data into dedicated archiving directories having different retention periods

5.5.2 Archive Policy

- All archived data stays online and cannot be modified, neither deleted during the defined retention period
- Once the retention period expires, it’s the user administrator responsibility to delete the data
- All archived data is tiered out of the primary storage towards specific archive storage arrays
- For disaster recovery the archived data is replicated between two sites
- After archiving, only data file relationships are backed up within the normal backup policy

5.5.3 Archive Implementation

It is the responsibility of the Publications Office to define the objectives to reach in terms of availability/unavailability of the archived data.

Based on these requirements, the contractor must define the archive procedures to implement in order to fulfil the requirements. Ideally, the contractor must base these archive procedures on techniques the Publications Office’s staff is familiar with (see contents of this appendix).

If the wishes of the Publications Office in terms of availability cannot be satisfied with techniques the Publications Office’s staffs is familiar with, the contractor must provide a full description of the procedures and techniques to use so that the implementation by the Publications Office’s staff could happen smoothly.
## 6 Workstations and Peripherals

In terms of software, the standard configuration for the workstations is the following:

<table>
<thead>
<tr>
<th>Type</th>
<th>Product/Version recommended for new development projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>Windows 7, 32 bit and 64 bit</td>
</tr>
<tr>
<td>Office automation suite</td>
<td>MS Office 2010</td>
</tr>
<tr>
<td>Web browser</td>
<td>MS Internet Explorer 8 (with 128 bit encryption)</td>
</tr>
<tr>
<td></td>
<td>Firefox 3.6</td>
</tr>
<tr>
<td>XML tools</td>
<td>XMLSpy (development)</td>
</tr>
<tr>
<td></td>
<td>XMetaL (Authoring)</td>
</tr>
<tr>
<td></td>
<td>MS XML 4.0 &amp; 6.0</td>
</tr>
<tr>
<td>Reporting tools</td>
<td>Business Objects XI Release 3.1</td>
</tr>
<tr>
<td>Mail client</td>
<td>MS Outlook 2010</td>
</tr>
<tr>
<td>Connection middleware and runtimes</td>
<td>SQL*Net 2.3.4</td>
</tr>
<tr>
<td></td>
<td>Oracle NET 8.1.7 – NET 9.x – NET 10G</td>
</tr>
<tr>
<td></td>
<td>ODBC</td>
</tr>
<tr>
<td>Anti-virus</td>
<td>McAfee VirusScan 8.8</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Adobe Flash player 11.0.1.152</td>
</tr>
<tr>
<td></td>
<td>Java V1.6 or newer</td>
</tr>
<tr>
<td></td>
<td>MS Dot NET 4</td>
</tr>
<tr>
<td></td>
<td>PowerBuilder Runtime 10.5/5.04/6.51</td>
</tr>
<tr>
<td></td>
<td>MS Sync Framework 2.0</td>
</tr>
<tr>
<td></td>
<td>EMC² SourceOne client 6.7</td>
</tr>
<tr>
<td></td>
<td>CURL Runtime 3.07</td>
</tr>
</tbody>
</table>

Software that needs to have a client part installed on workstations should be deployable with Microsoft virtualisation tool App-V 4.6

Some other local production tools (Visio, Microsoft Project…) could also be found on the workstations as well as more specialised tools which are used for publishing (Adobe Photoshop, Adobe Acrobat PRO and Reader, Adobe CS4 and CS5, InCopy, InDesign, QuarkXPress …).

The exact version of an application may change without warning when for example security reasons make it necessary for the Publications Office to apply hotfixes to all workstations.

A small number of workstations are UNIX-based or Macintosh-based.

In terms of hardware, the workstations are ranging from AMD Athlon64 X2 2.0 GHz to Pentium Core2 2.9 GHz with 2 GB to 4 GB of memory.

Various types of peripheral equipment are also installed, such as local and remote printers, faxes, scanners, CD burners, etc.

All workstations are clients of the LANDesk Workstation Manager server, which allows remote control and software/hardware inventory.

Local data on the workstations is not backed up and users are therefore encouraged to use only shared resources for storing valuable/persistent information.
7 UNIX Servers

The Publications Office computing centres host more than 45 Sun Microsystems/Oracle servers/domains mainly based on the Sunfire platform (V210, V890, SF25000), on T5220/T5240 Enterprise servers and on M5000 Enterprise servers. The CPU’s are mainly Ultra Sparc VI (2.15 GHz), Ultra Sparc VII (2.53 GHz), Ultra Sparc VII+ (2.66 GHz) and T2 (1.2 GHz). These servers host more than 90 virtual servers (container/zone).

In addition to the Solaris servers, there are also some HP x86-64 servers running Red-Hat Enterprise Linux. Some of these host KVM-based virtual machines.

Solaris SPARC 64 bit is the production baseline Operating System: Red-Hat Enterprise Linux is mainly used for monitoring of the Publications Office information systems.

In terms of software, the following table gives an overview of the main products used:

<table>
<thead>
<tr>
<th>Type</th>
<th>Product/Version installed</th>
<th>Product/Version recommended for new development projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating system</td>
<td>Sun Solaris 8 – 9 and 10</td>
<td>Solaris 10 in zone/container</td>
</tr>
<tr>
<td>DBMS</td>
<td>Oracle from 8.0.5 to 11g R2</td>
<td>Oracle 11gR2 Character set: AL32UTF8</td>
</tr>
<tr>
<td>Text retrieval</td>
<td>Oracle Intermedia/Context</td>
<td>Oracle Intermedia/Context</td>
</tr>
<tr>
<td>Web servers</td>
<td>Apache 2.x</td>
<td>Apache 2.x</td>
</tr>
<tr>
<td>Application servers</td>
<td>Adobe ColdFusion MX6.1</td>
<td>Adobe ColdFusion MX 8</td>
</tr>
<tr>
<td></td>
<td>Adobe Tomcat 4.x, 5.x</td>
<td>Apache Tomcat 6</td>
</tr>
<tr>
<td></td>
<td>JBoss 2.4</td>
<td>JBoss 5.x</td>
</tr>
<tr>
<td></td>
<td>Oracle iAS 9.0.2</td>
<td>Oracle WebLogic 11¹</td>
</tr>
<tr>
<td></td>
<td>BEA WebLogic 8.1</td>
<td></td>
</tr>
<tr>
<td>ERP</td>
<td>Oracle Financials 11i</td>
<td>Oracle Financials 11i</td>
</tr>
<tr>
<td>Programming languages</td>
<td>Java 1.4.x/1.5.x</td>
<td>Java 1.7.x</td>
</tr>
<tr>
<td></td>
<td>Natural 6.2</td>
<td></td>
</tr>
<tr>
<td>Scripting languages</td>
<td>Perl 5.6</td>
<td>Perl 5.10</td>
</tr>
<tr>
<td></td>
<td>sh/ksh</td>
<td>sh/ksh</td>
</tr>
<tr>
<td>Workflow/Document management systems</td>
<td>Documentum Content Svr 5.2.5(inc. CRS/DTS module)</td>
<td>Documentum Content Svr 6.6 or above Other third party products</td>
</tr>
<tr>
<td>Enterprise architecture and business modelling tool</td>
<td>ARIS platform: Business &amp; IT Architect (IDS-Scheer) v7.1SR 8 or higher</td>
<td>ARIS platform: Business &amp; IT Architect (IDS-Scheer) v7.1SR 8 or higher</td>
</tr>
<tr>
<td>Search and index tools</td>
<td>Autonomy IDOL 7</td>
<td></td>
</tr>
<tr>
<td>Web analytics tools</td>
<td>Webtrends Analytics v8.7d</td>
<td>Webtrends Analytics v8.7d</td>
</tr>
<tr>
<td></td>
<td>Marketing Warehouse v4.0</td>
<td>Marketing Warehouse v4.0</td>
</tr>
<tr>
<td></td>
<td>(Windows 2008 version)</td>
<td>(Windows 2008 version)</td>
</tr>
<tr>
<td>XML related tools</td>
<td>XSV (XXML Schema)</td>
<td>XSV/XERCES (XML Schema)</td>
</tr>
<tr>
<td></td>
<td>RXP (DTD)</td>
<td>RXP (DTD)</td>
</tr>
<tr>
<td></td>
<td>SAXON (XSLT)</td>
<td>SAXON/XALAN (XSLT)</td>
</tr>
<tr>
<td>Middleware</td>
<td>WOOD²</td>
<td>WOOD</td>
</tr>
<tr>
<td>Monitoring, measurement and production management tools</td>
<td>Nagios</td>
<td>Nagios 3.x</td>
</tr>
<tr>
<td></td>
<td>Oracle Enterprise Manager – Grid control</td>
<td>Oracle Enterprise Manager – Grid control</td>
</tr>
<tr>
<td></td>
<td>EMC ControlCenter</td>
<td>EMC ControlCenter</td>
</tr>
<tr>
<td></td>
<td>Sextant MPI 9.5</td>
<td>Sextant MPI 10</td>
</tr>
</tbody>
</table>

¹ The use of WebLogic must be justified and must be validated by the Office
² proprietary tool based on Perl
More than 100 Oracle instances (production + test) are currently installed for about 50 different applications.

Monitoring and reporting tools have been built around small third-party products (e.g. Nagios) and in-house developments.

For critical applications, Sun Cluster installations have been built.

7.1 Standard File System Organisation on UNIX Systems (Directory Structure)

In order to ease the co-existence of applications on the same server and to ease the potential move of an application to another server, applications are generally installed under /applications/application_name/ where application_name refers to the name of the application.

This level is then subdivided into:

- /applications/application_name/users which is itself subdivided into:
  - /applications/application_name/users/system: directory simulating the root directory for the application. Specific products used by the application are installed here (e.g. the web server is installed under /applications/application_name/users/system/apache/, the application server is installed under /applications/application_name/users/system/tomcat/).
  - /applications/application_name/users/oracle: Oracle application, oracle environment, and oracle admin directory.
  - one or more directories /applications/application_name/users/user_name: home directories of the users user_name used by the application. These directories are linked to /home/user_name. Generally, there is only one directory /applications/application_name/users/user_name and user_name is identical to application_name.
  - /applications/application_name/xchange: root of interfaces (in case of exchange of data with remote applications). The following specific structure is used:
    - /applications/application_name/xchange/import/remote_application_x/(sublevel if necessary) for incoming data and
    - /applications/application_name/xchange/export/remote_application_x/(sublevel if necessary) for outgoing data
  where application_name refers to the name of the application and remote_application_x refers to the name of the remote application.
  e.g. /applications/eub/xchange/eudor/in is used for the data flow exchange from eudor to eub.
  /applications/eub/xchange/gescom/gcb/out is used for the data flow exchange from eub to the gcb part of gescom.
  - /applications/application_name/oradata: Oracle datafiles.
  - /applications/application_name/oraexp: Oracle exports
  - /applications/application_name/oralog: Oracle online archive logs.
Deviations from this description are possible but the Publications Office must first validate the deviations.

(The names of the different file systems are marked in **bold**)

```
/applications
  |-- /application_name
  |   |-- /users
  |   |   |-- /system  (installed by Publications Office)
  |   |   |       |-- /init.d               Start/stop scripts
  |   |   |       |-- /product_1         (e.g. Tomcat, Apache, ...)
  |   |   |       |-- /...               
  |   |   |       |-- /product_n
  |   |   |-- /oracle               Oracle binaries
  |   |   |       |-- /user_name_1     (link to /home/user_name_1)
  |   |   |       |-- /...               
  |   |   |       |-- /user_name_n     (link to /home/user_name_n)
  |   |-- /oradata               Oracle data files
  |   |       |-- /oraexp          (if required) Oracle export
  |   |       |-- /oralog            Oracle logs
  |   |       |-- /data_1           (e.g. Documentum file store) application data
  |   |       |-- /data_...         (if required) application data
  |   |       |-- /data_n           (if required) application data
  |   |-- /xchange
  |       |-- /import/remote_application_1
  |       |-- /export/remote_application_1
  |       |-- ... other interfaces ...
```
8 Windows Servers

The Publications Office computing centre hosts about 180 MS Windows servers in a Windows 2003 R2 Active Directory domain. Some servers are virtual machines running on VMWare/vSphere. All new physical servers are 2 or 4 CPU servers. Some are installed in cluster mode (for critical data and processing).

Besides standard functions like user authentication, roaming profiles, home directories, shared drives (public/group) and print services that are spread over several servers in order to improve reliability and performance, the Windows servers also host services like email (Exchange 2007), fax gateways, Share Point 2007, standalone applications and other small information systems (in-house developments, automated tasks using Microsoft Office products, small SQL server DB, IIS servers with Coldfusion, etc.).

<table>
<thead>
<tr>
<th>Type</th>
<th>Product/Version installed</th>
<th>Product/Version recommended for all new developments</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS virtual servers</td>
<td>VMware ESX Server vSphere 4.X 5.X</td>
<td>VMware vSphere 5.x</td>
</tr>
<tr>
<td>DBMS</td>
<td>MS SQL Server 2005/2008</td>
<td>MS SQL Server 2005/2008</td>
</tr>
<tr>
<td>Intranet / Collaborative</td>
<td>SharePoint 2007</td>
<td>SharePoint 2007/2010</td>
</tr>
<tr>
<td>Web servers</td>
<td>IIS 6 / 7 / 7.5</td>
<td>IIS 7.5</td>
</tr>
<tr>
<td>Application servers</td>
<td>ColdFusion MX8</td>
<td>ColdFusion MX8 MX9</td>
</tr>
<tr>
<td>Mail servers</td>
<td>MS Exchange 2007</td>
<td>MS Exchange 2010</td>
</tr>
<tr>
<td>Reporting tools</td>
<td>SCOM2007 / PROMODAG</td>
<td>SCOM2012 / PROMODAG</td>
</tr>
<tr>
<td>Backup</td>
<td>Networker 7.5 SP1</td>
<td>Networker 7.6 SP1</td>
</tr>
<tr>
<td>Archiving System</td>
<td>EMC DiskXtender / EmailXtender</td>
<td>Source One / FMA</td>
</tr>
</tbody>
</table>

For business critical reasons, Windows clusters host the Exchange server with about 1400 mailboxes, the shared drives and the disk spaces accessible to all end-users. All production data is stored on the SAN.

Regarding security on the server side, anti-virus checking is performed on the Microsoft Exchange mailboxes and regularly on file systems.
9 Standard Operating Procedures

This section provides information on the operational procedures and standards of R4 Infra/Ex (the Exploitation section of the Infrastructures unit of the Publications Office).

9.1 Management of Bug Reports and Change Requests

Contractors and suppliers must propose procedures that specify how to manage bug reports and change requests. These procedures must allow the unambiguous identification of every bug report and change request. The Publications Office hosts an instance of the Jira issue tracking product that is accessible from the internet and may be used for this purpose.

9.2 Software Deliveries

The Publications Office reserves the right to measure the quality of software deliveries it receives from contractors and suppliers, based on agreed-upon criteria, and reject any software delivery that does not fulfil these quality criteria. These criteria should be defined and validated in the project kick-off meeting by the different parties.

The Publications Office monitors the compliance of software deliveries with contractual obligations that arise as part of this contract; non-compliance with contractual obligations concerning the delivery of software may lead to rejection of the delivery. The compliance with standards and procedures will be measured and recorded and feedback will be given to the contractor, who is obliged to take these remarks into account for subsequent deliveries.

The Publications Office reserves the right to request information from contractors and suppliers concerning the development and delivery process. To this end, the contractor may be required to fill in a set of templates that will enable the Publications Office to gain insight into how the contractor complies with industry standard best practices concerning software development processes.

The Publications Office will measure metrics of the source code delivered in a process based on automated tools and on request deviating results must be justified or corrected by the contractor.

A software delivery can concern either a full installation or a partial installation that needs to be installed over an existing installation, for example as part of a patch or a hotfix. It should be clearly indicated whether a delivery concerns a full or a partial installation to be able to estimate the effort required. The installation instructions must be customised and targeted to the particular installation.

Application software delivered to the Publications Office by the contractor shall comply with the following rules:

- The contractor must define a detailed and unambiguous numbering scheme and use it for each software delivery.
- The delivery should contain the source code of the application and the executable binary code that can be deployed and installed by following the installation instructions.
- The first delivery of an application should be as complete as possible and include all required components; subsequent deliveries should only contain the updated components required for the current installation request.
• The delivery has to be uploaded to the revision control system of the Publications Office, which is currently based on Subversion.

- If the revision control system is not used, the software will be delivered in a standard archive format (e.g. tar) with compression (gzip, compress, zip,...). The compressed archive files should be created using relative paths so that it can be uncompressed in an arbitrary directory.
- If the revision control system is not used, the contractor should provide an MD5 checksum along with each delivered file so that it can be verified that no data corruption occurred during data transfer.

• Each delivery shall include installation instructions (in electronic, editable format); the minimum contents of the installation instructions are further detailed in section 9.5 Installation Instructions.
• Each delivery shall include a release note (in electronic format) containing the following information:
  - project/application name
  - unambiguous identification\(^1\) of the version of the delivered software
  - for partial deliveries, the version of the application that is a prerequisite for the installation of the delivered package
  - for full deliveries, whether or not the installation has to take place on a clean environment
  - details on the changes or enhancements that are implemented with the delivered release
  - approximate uncompressed size of the delivery
  - a reference to the installation instructions (as defined in 9.5 Installation Instructions)
  - information about test results and the test procedure

• Each delivery that contains the source code of the application shall include a build procedure detailing how to build the executable code from the source code. The build procedure should contain a default target so that the build process can be automated.
• Each delivery shall include a TEST folder containing all the necessary information to be able to verify that acceptance testing has been performed by the contractor before the software was delivered. This folder will contain:
  - test procedures and test cases executed
  - test data used
  - test results and/or execution report

### 9.3 Technical Tests

Before an application is put into production, the Publications Office will conduct specific technical tests to assess whether the application adheres to the operational requirements of being run and operated in its data centre.

Depending on the results of these technical tests, the Publications Office reserves the right to reject a software delivery.

The contractor must foresee in the planning of the project a dedicated period of time for the execution of technical tests.

\(^1\) In accordance with the procedure defined in the approved quality plan
The technical tests will be performed by the Publications Office's staff in close collaboration with the contractor and based on the test procedures and test cases prepared by the contractor.

The contractor will prepare a report of the execution of the technical tests. The contractor will deliver this report to the Publications Office, together with the test data used. The test procedures and test cases will first be validated by the Publications Office.

The test procedures/test cases must allow validating at least the following elements:

- application start and stop procedure
- application backup and restore procedure (including consistency checks after restore)
- disk space usage
- location of the log files
- periodic operational tasks (data reorganisation, purging, archiving, indexing...)
- correct working of the interfaces
- virtualisation capability (suitability of the application to be moved from one server to another) in the context of disaster recovery (DRP) and high availability (HA)

The effectiveness of the procedures but also their efficiency will be tested. Their impact on the overall performance of the system will be evaluated too.

The test procedures/test cases must refer to procedures described in the System Operation Manual in order to validate this manual. The minimal contents of the System Operation Manual are described in section 9.6 System Operation Manual, the contractor is free to add any other information deemed useful.

For the execution of the technical tests the Publications Office uses monitoring and measurement tools listed in section 7 UNIX Servers and section 8 Windows Servers. The technical tests will be conducted with a significant amount of data in order to evaluate the impact of data volume on effectiveness, performance and efficiency of the application.

Special attention will be placed on the CPU, I/O and memory intensive and time consuming tasks like:

- data archiving
- data purging
- data reorganisation
- data consistency check
- data synchronisation
- data indexing
- statistics

### 9.4 Installations

For each application, two different environments are set up at the Publications Office, a test environment and a production environment. No software installation in the production environment will be allowed without prior validation in the test environment.

The Publications Office strongly advises the contractor to set up at their premises a development environment similar (e.g. same OS version, same RDBMS version...) to the target production environment. It remains the responsibility of the contractor to
make sure that the delivered software will run correctly in the technical environment of the Publications Office.

The installation of hardware, the operating system and other low-level software remains the responsibility of the Publications Office. The installation of application software is done by a dedicated team of integrators. If the complexity of an installation requires special expertise, the support or assistance of a technical expert of the contractor may be formally requested by the Publications Office; this support may be provided off-site (remotely by email or telephone) or on-site, depending on the specific situation.

Apart from the test and the production environments, the Publications Office may decide to set up an additional environment in order for contractors/suppliers to demonstrate that the software delivered can be installed and run correctly within the technical environment of the Publications Office while conforming to the requirements as described in the technical and functional specifications. In this case, the contractor will perform all installation and configuration tasks, with the assistance of technical staff of the Publications Office. The contractor will be granted the necessary access rights so that all necessary installation and configuration tasks can be performed. The granted access rights will be limited to those allowed by the security standards of the Publications Office. If the Publications Office requests the contractor to perform this demonstration, no associated costs will be reimbursed.

In order to ensure smooth installation and to evaluate the need for assistance or support by the contractor, the installation instructions should be delivered to the Publications Office 5 days before the official software delivery date, i.e. 5 days before the start of the official installation period.

The Publications Office uses a tool (Atlassian JIRA) to manage installation requests. Atlassian JIRA is a web-based application that can be accessed from the internet, which makes it possible for the contractor to monitor the progress of an installation request.

9.5 Installation Instructions

This section details the minimum contents of the installation instructions. The Publications Office will provide a template to help with creating the installation instructions on request.

9.5.1 General Conditions and Limitations

The installation document is a compulsory requirement for each delivery and has to provide step-by-step instructions to be executed, organised in a sequential and logical manner.

The installation instructions should contain all information necessary to perform the implementation tasks of the installation by an experienced system integrator without knowledge of the application.

Variables and parameters of the application that have dependencies with other software applications or the operating system should be made configurable. Variables and parameters that need to be changed or adapted for a specific environment have to be clearly marked and if their values are unknown, sufficient information has to be provided that makes it possible to identify the required value.

The installation instructions have to clearly indicate who will be responsible for the execution of a particular task; complex actions should be broken down into smaller
tasks; as far as possible, where different actors are involved in the execution of tasks, these tasks should be grouped together by actor to minimise a back-and-forth between different teams and to make the installation process more seamless.

9.5.2 Specific Conditions and Limitations

- the internal standards and procedures of the Publications Office pertaining to the installation and operation of software applications must be respected
- use of root user is prohibited; installations are to be done using a user identification that is specifically created to install and run the application; where root access is required during installation, this must be explicitly stated
- use of sysdba is prohibited where database access is required
- kernel and system parameters should not be changed
- hard-coded IP addresses have to be avoided

9.5.3 Pre-requisites

The installation instructions describe in detail the hardware configuration (agreed at the beginning of the project) and the software configuration that has to be in place before the installation is started.

- Minimum hardware requirements (CPU, memory, disk space, network throughput, etc) in compliance with the standards of the Publications Office.
- Software requirements (version, patches, specific configuration parameters, required modules, etc) for software required to install the software delivery, for example the operating system, tools, and other pre-requisite software. For some software, for example Oracle, some supplementary modules might be required. In case of specific patches or service packs required, the exact version of the concerned application or component that has to be in place before the application can be installed should be specified.

9.5.4 Application Interface/Data Flow

The installation instructions should give an end-to-end description of each data flow. For each flow, the following elements should be described:

- origin (source server name and directory)
- destination (target server name and directory)
- protocol to be used (including user identification and password required if applicable)
- estimate of volume of data exchanged
- how data transfers are scheduled or triggered
- description of pre- or post-processing commands to be executed
- error handling (including users and email distribution lists to inform)

9.5.5 Application Installation

This section concerns the information that needs to be provided for the installation of the application software. In case the application architecture follows the client/server model, the installation instructions for client and server have to be kept separate.

- Preparation

- Description of the tree structure of the installed files
- List of all compressed and uncompressed files included in the delivery
• List of file systems to create with sizing
• Description of the logical and physical layout of the Oracle Database (if any), taking into account the following rules:
  - each database schema must contain at least two table spaces, one for the data and one for the index (e.g. if there are 2 oracle schemas, 4 table spaces are created: 2 table spaces for the data and 2 for the indices)
  - extra table spaces can be foreseen to address special needs (e.g. in case of partitioning)
  - for each table space, the initial size of the corresponding data file must be specified
• List of specific users, groups, and roles to be created and, for the database, the privileges to grant (the DBA role is not allowed). Generally, for web-based applications, the user accessing database objects through the web interface is not the owner of these objects in order to avoid accidental deletion of objects. This implies that the required privileges should be granted to the user accessing the database objects.
• Environment variables to define; variables will be used in order to avoid hard-coded values in the application source code or scripts; variable names should be meaningful.

**Installation Procedure**

• The installation procedure should be organised in clearly identified steps. Each step should have a sequence number, an application level description and technical comments.
• The installation procedure should be based on scripts to launch commands rather than on sequences of commands to type to avoid typing or cut-and-paste mistakes.
• The installation procedure should produce an installation log file.
• The installation procedure should be able to cope with the standard configuration of the host system.
• The installation instructions must offer the opportunity to arbitrarily and independently choose the installation, execution and data directories.
• The installation instructions should contain the location of the configuration files and a list of useful parameters
• The configuration parameters should be grouped in a minimum of configuration files; global configuration files should be used to avoid multiple definitions of the same parameters or variables. A section of the installation instructions should list all configuration parameters and the specific values used for the installation in the environment of the Publications Office. If technically possible, application parameters should be set in configuration files that are outside of application files (ear, war, jar,…).
• For easier installation, administration and trouble-shooting, the log files produced by the application should be contained in as few folders as possible; log4j or a similar logging framework should be used.
• The log files produced by the application and underlying systems must be properly managed; in particular, log files should be rotated daily and a mechanism should be foreseen to limit the number of log files.
• Oracle scripts should appropriately use the "commit" statement, together with the "whenever sqlerror exit rollback" and "whenever oserror exit rollback" statements in order to ensure application data consistency in case of errors.
• Ideally, all scripts needed to build the elements of the database (i.e. creation of the table spaces, tables, indices, triggers, users and roles including the privileges to grant, ...) and to load the data should be delivered. An alternative is to deliver a script to create the table spaces and the users and the export (dump) of the data.

• **Post-installation**

The installation instructions should contain a check list that details:

- the list of all files modified during the installation
- the list of periodic jobs to schedule
- a procedure to check the correct installation/working of the application: basic checks to be performed by the person in charge of the installation should allow to check if the application is behaving correctly without requiring a full functional validation.

• **System Uninstall**

A detailed procedure how to uninstall the application should be provided that follows the same general remarks as the ones for the installation instructions.

9.6 **System Operation Manual**

This section describes the minimum contents of the system operation manual.

9.6.1 **Hardware and Software Architecture**

This section should contain:

- schemas that depict the hardware and software architecture
- a list of installed software including:
  - name of the product/tool
  - version
  - installation parameters (e.g. installation path, users, groups, environment variables...)
- a description of all file systems used by the application with their content and specific access rights (including any temporary space used)
- a description of the specific users, groups, and roles used by the application
- details of the network configuration including:
  - interfaces used
  - IP addresses
  - virtual hosting
  - IP and port bindings
  - specific routing
  - name servers
  - LDAP servers used
  - local name resolution

9.6.2 **Configuration**

• **Application Start-up and Shutdown**

The sequence of steps to start and stop the application and any dependencies will be described. It must be possible to automate the start/stop procedure; the contractor is requested to deliver start/stop scripts for the application that can be integrated in the operating system service management framework.
• **Configuration Files**
  This section should specify:
  - the location of the configuration files on the hard disk
  - a list of useful parameters
  - how to modify these parameters

• **Log Files**
  This section should specify:
  - a description of the contents of the log files
  - the location of the log files on the hard disk
  - how to set different log levels
  - clean-up and archiving (regular purge and rotation)

9.6.3 *User Management*

• **User Management**
  This section should describe:
  - how to create and delete users
  - how to manage access rights and privileges
  - information on the authentication mechanisms used by the application

9.6.4 *Backup and Restore*

• **Backup Procedure**
  A detailed backup procedure that includes at least the following elements must be provided:
  - list of file systems/directories to backup (including pattern of file names to backup)
  - scheduling/triggering schema
  - pre- and post-processing commands to execute
  - specific techniques to use (e.g. snapshot, hot backups...)

• **Restore Procedure**
  A detailed restore procedure covering the most common disaster situations should be provided. Special attention should be put on the following aspects:
  - sequencing of the restore operations in order to minimise the downtime
  - consistency checks to execute
  - repair/resync procedures to execute
  - system operation checks after restore

• **Copy Procedure**
  A detailed procedure on how to copy an existing installation from one environment to another must be delivered. This procedure should allow creating a copy of for example the production environment to a test environment. This procedure must clearly indicate the parameters to modify in order to have a fully operational system in the test environment after completion of the copy procedure. The procedure must require as few manual interventions as possible.
9.6.5 Monitoring

- Monitoring

The contractor must deliver instructions on how to check the availability and the response time of the application; it should be easy to integrate these checks in an automated monitoring system (for example, a set of URLs to check); currently, the monitoring system at the Publications Office is based on Nagios. The instructions and checks to be performed should cover all major components of the application, including components that the application depends on (like database server, middleware and other computer software that provides services to the software application beyond those available from the operating system).

This section should contain:
- a list of file systems to monitor with thresholds and critical values
- a list of processes to monitor with thresholds and critical values
- the description of monitoring and alert mechanisms included in the application
- a list of resources (e.g. URLs in the case of a web application) that can be monitored in an automated and unattended manner by a system and network monitoring application

9.6.6 Application Management

The system operation manual should contain at least the following section with the suggested minimum contents.

- Administration Interfaces

  A detailed description of all available application administration interfaces will be provided. This section will at least include:

  - how to access the administration interface
  - a description of the functionality and features
  - instructions for use

- Periodic Tasks

  The tasks that have to be executed on a regular basis should be described in this section. It should be possible to automate these tasks as much as possible, for example by providing a script. For each task, the following information will at least be provided:

  - description of the task
  - procedure to execute
  - how to schedule or trigger the task

  Special attention should be put on the description of resource intensive and time consuming tasks like:

  - data archiving
  - data purging
  - data reorganisation
  - data consistency check
  - data synchronisation
  - data indexing
  - statistics

- Database Management Tasks
All specific database-related tasks that are not already described above should be described here.

- **Best Practices and FAQs**
  
  A description of best practices for dealing with common issues, troubleshooting procedures, hints and tricks, and a list of frequently asked questions should be included here.

**9.7 Access to the Environment of the Publications Office**

No direct access (telnet, ftp...) to the Publications Office's environment (production or test) will be granted to the contractor.

Specific interfaces (e.g. Web/CGI) have to be developed for the administration of the application (e.g. periodic follow-up) and/or the production follow-up, if required. Especially the access to interfaces (data exchange directories) must be controlled by the application in order to validate the contents of the data exchanged and to allow the "replay" of data transfers.