Development of Institutional Electronic System at NSSI for EESSI
Guideline for Experts in Information Services

February 2014

NSSI

Content

I. General Description

In 2012, the terms of reference have been prepared for a project in the NSSI with a name:

Consultancy service for the construction of internal institutional modules in the NSSI for servicing of the system for electronic exchange of social security information in the European Union (EESSI)"

The terms of reference were designed for implementation in the form of a public procurement.

The scope of the public procurement includes a service for analysis and consultation of the work of the expert group in the NSSI, which has the task to develop and install software applications to work with structured electronic documents (SEDs) in the integrated environment of the information system of the NSSI. On the grounds of the set of SEDs provided by the European Commission, electronic forms of the SEDs used in NSSI under the applicable law should be designed and they should be implemented in the portal solution and the information system of the NSSI should be prepared for use of the WEB interfaces of the system for electronic exchange of information of the European Union.

The consultancy service covers the implementation of the following activities:

1.1. Analysis and evaluation of the basic solution (platform) for program work of the Expert Group in the NSSI and schemes of SED at their implementation;

1.2. Analysis and evaluation of the principal means of communicating with the system and interfaces provided at the time by the European Commission;

1.3. Analysis and evaluation of the applicability of the requirements of the European Commission on XML, XSD schemes of SED in software applications in the storage of data in the information system of the NSSI and in communicating with Web Services interfaces provided by the European Commission;

1.4. Reverse Engineering of 1 developed flow;

1.5. Design of processes, using of case models and case specifications;

1.6. Analysis and recommendations for optimizing the IT infrastructure of the NSSI in connection with the SEDs, including:

- Redesign of the infrastructure in the Headquarters and the territorial offices of the NSSI;
- Defining a unified comprehensive Forest/Domain structure in the information system of the NSSI and a scheme for migration to the latest available version of the base software (currently Windows 2003/2008 R2);
- Plan for migration of DC/AD in the Headquarters and the territorial offices of the NSSI to the latest versions of the base software and subsequent migration;
- Plan for migration of the information from Exchange Server to a higher version and combining the existing 30 installations in the NSSI at the time and subsequent migration;
- Analysis of the roles of users and administrators of the system in terms of securing rights in Forest and Exchange;
- Plan for migration of e-mail and e-mail addresses of users and subsequent migration;
- Plan for integration of the SEDs in SP2010 (or the last newer version available) in a single form;

1.7. Integrating the functions of Share Point 2010 or a newer version in the portal with the e-mail in the NSSI. Preparation of analysis and plan for migration and installation of Exchange 2010 (or a newer available version) in the system of the NSSI. Migration from the earlier version Exchange 2003 to ensure sending messages to users of the portal;

1.8. Building a prototype of the software solution in the Headquarters of the NSSI for one flow specified by the Principal;
1.9. Testing of the developed applications, including:

Ensuring the transfer of knowledge and experience to the Expert Group in the NSSI during the implementation of the service (subject of the procurement);

On the basis of the so-shaped terms of reference, the description, development, testing and implementation of a project internal for the NSSI concerning the implementation of Regulation 883 of the EC was launched.

In practice, the EC provides a solution with an interface for users (WEBIC), which is a WEB oriented software. Its installation and testing show too much problems, so the so called "reflex period" was introduced by the European Commission for analysis and elimination of defects. The application works connected with the central node in Brussels, and with its help, the exchange of data between countries / respectively, the individual access points is executed. The application also provides API functionality implemented in the context of web services.

The desktop application is designed to facilitate the implementation of the Regulation. It therefore has no orientation to the internal systems of the organizations which should be acquiring data for SEDs. There is no integration at the level of authorization. There is no separation according to the functions performed by employees. For this reading, many EU countries have launched internal projects to solve these cases, as some of them also focus on legislative changes allowing aggregation of data and its exchange to happen through one access point. In Bulgaria, only the NSSI, where one of the contact points, started the above described project, which is with European funding. As seen from the above-described, the objective of the project includes the preparation for organization of information flows in a form suitable for loading SEDs. A particularly important task is the storage of the information received and also its preservation in historical aspect. An important part of the work constitutes the creation of system that allows working with SEDs according to the structure of the units in the Institute and the ERIA Directorate.

Last but not least is the question of creating a system by which reports can be generated in accordance with the needs of the NSSI.

SED documents which by a commitment should to be processed in the 4 contact points in Bulgaria are numerous. The largest number of them is recognized as an obligation of the NSSI – over 100. This in turn defines the task except as too complex in terms of information also as very large for realization.

On the grounds of the aforesaid, it was decided for various options for implementing the system to be acted out. In the group for the project, a description of the requirements from the business side was made. Based on the SED analysis, the sources which should feed the environment in the IS of the NSSI were identified. Attempts were made to design a database in various ways, including those involving storage of the documents in XML. Attempts were made to model the screen forms of SED with MS Info Pad forms, which was relatively easy to handle, but with insufficient flexibility as to the requirement for redesign, connection to external sources of data, recording in the database, etc.

The design of EESSI provides work with both SED and unstructured documents. This raises questions about their storage and maintenance. As a turnkey solution for the implementation of this requirement, the software product MS SharePoint was selected. The product provides a huge variety of features, including such associated with the subsequent

preparation of reports. The product has a built-in search by various criteria. There is a possibility for the use of user groups and roles inherited from AD.

The choice of the solution for creation of the forms was made after the commencement of the joint work with the consultant on the project. On the grounds of the set requirements, a business model of a flow was made. The decision was to use "custom forms", integrated into the SharePoint portal. For the database, a decision was made to create a relational database MSSQL storing all the attributes of SED in a structured form.

The development of prototype of an application for processing of SEDs is a complex system where most major products from the portfolioto of Microsoft interact. The development environment for this is Visual Studio 2012.

The prototype of the application was installed in a test environment, together with the Contractor. Along with this, work is done for bringing the IS of the NSSI to modernization that will allow operation of the prototype and subsequent application based on portal solution therein.

Support of the modernization of the infrastructure of the IS of the NSSI is set in the requirements for the consultant. This is accompanied by a number of key trainings, oriented to the latest versions of the software products and the way of their use. Key documents were received concerning the migration to newer versions of the software as well as an overall implementation to a single 'Forest'. The requirement for a common domein is necessary in terms of the more and more widespread recent approaches for service usage. In this sense, the portal and the applications integrated into it can be used from each point in the IS of the NSSI through the authorization in the domain. The integration of Exchange server, which are prepared to work on a farm is realized similarly.

Achieving integrity in the IS of the NSSI can be done only after strict compliance with the technology. This should be a process that, in order to be successful, is understood, supported and guided by the business teams and Governance of the Institute.

II.   Used database for the application and general structure of the portal

1.   Reasons for the choice of a SharePoint environment:

• **Flexible platform for information sharing and document management** – All applications and documents are On-line and can be accessed from anywhere and at any time;
• **Single WEB based environment for work allowing access to information from virtually any device** – This makes the applications, developed for SharePoint, much more intuitive and to create a sense of a unified working environment for users;
• **Place to search and find any type of information** – a powerful search engine, allowing to search in the content of specific file types , i.e. those from Office and *. Pdf;
• **Basis for application development** – Since the platform is by Microsoft, that makes it very well integrated with Visual Studio and all languages provided therein;
• **Integration with Active Directory, Exchange and almost all products of Microsoft** – which makes the environment for the user look familiar and very easy to use;
• **Control of the access to information** – Allows easy management of user access rights to different resources by managing AD and Sharepoint groups;

2.   Architecture of the prototype in SharePoint

In the Headquarters of the NSSI in connection with the project "Construction of domestic institutional modules in the NSSI for servicing the system EESSI", a prototype was created of an application for SharePoint which will serve one flow (P-002 - Old age pension) with developed forms for one SED (P2000 – Application for pension), and a relational database with tables to serve this flow.

The entire solution is based on SharePoint, because in addition to structured documents, it also has to serve unstructured documents that are a part of the flow.

The idea of using SharePoint is to use its web interface for visualization of forms for filling in, validation, display and movement of the SEDs, as well as for storage of the unstructured documents in SharePoint databases with the ready interfaces offered by it for this purpose. Data from the SEDs will be stored in a relational database.

Some of the data can be loaded automatically from the existing information systems in the NSSI via different interfaces (Web services, Stored Procedures, etc.).

3. Design of the portal or how SharePoint on the inside

The application should be installed on one Web Application, which will contain one site collection for each TO and for each of the risks, for which the NSSI will exchange data within the EESSI. This makes approximately 120 site collections for the entire project or four site collections for each TO. Each site collection will be several libraries for storage of storing unstructured documents for each type of flows for the particular risk. Databases for the content of site collections should be grouped by risk i.e. there is one common database which contains all pension unstructured documents from all TO.

For the moment, the prototype was realized on only one site collection.

4. Access rights realized in the prototype

SharePoint necessarily works in a domain environment, which requires integration with AD.

Within the prototype solution, it is defined that users who will use it are divided into random AD groups, which should be associated with specific pre-specified SharePoint groups which currently are:

- EESSI UGSupervisors (users who will give tasks)
- EESSI UGClerks (users who will prepare SEDs)
- EESSI UGControls (users who will control)

In SharePoint groups, only AD groups must be added, because the logic of the prototype is currently to expect only such ones. There will be AD groups for each TO and for each risk – for example:

- Pensions Varna;
- Benefits Plovdiv, etc.

5. Integration of the prototype with the EESSI

Communication of the EESSI with the prototype is not currently a part of the project, but

the idea is for the data which will be sent to go through an intermediate layer that will generate XML (SED) as an output for the receiving institution, and for input to convert the received XML (SED) into data suitable for deployment in a relational structure.

6. Architecture of the database

One of the main design issues is "Why not structured data and not XML data"

The assessment was the subject of extensive discussions at the beginning of the project. The options are:

1. The data to be stored directly in the <u>XML</u> fields in tables in the database;
2. The data to be stored in a different set of tables for the respective SED.

In the first case, it appears that such data is subsequently difficult to manipulate. It is necessary to decompose the XML at each retrieval and recording of application data in order to break the record to its relevant attributes. Furthermore, there is no guarantee of the purity of the data because there is no fully normalized structure.

In the second case, the only drawback (at least for now) is the complexity of designing a relational database. An example can be given that only for the storage of data from flow P- 002, about 36 tables were created for the 8 SEDs, which are included in this flow, without listing the nomenclature tables and those for the status and the movement of the flow and the SEDs. However, a normalized database is obtained, in which relationships between data, nomenclatures and data for the movement of SEDs is clearly defined. It is easier to define the various sections for future reference without the need for extraction of the whole XML and then its decomposing. Moreover, easy integration is obtained with existing data sources in the NSSI.

III. Work in integrated environment – extraction of data from the registers of the NSSI

Structured electronic documents (SED) require the entry of large amounts of data. Much of this data is in the information systems of the NSSI. In order to facilitate the work of the employees entering the data in the SEDs, a methodology was developed for extracting data from the data records of the NSSI. This is done in several stages:

• SED analysis – Determination of matching fields from records in the NSSI and fields in the SED;
• Determination of the database on the grounds of the SED analysis from which to extract the necessary data;
• Identification of software tools for extraction of the data – stored procedures, functions or Web services;
• Development of the program code for extraction of data.

SED analysis
In the SED analysis conducted by the business teams of the ERIA Directorate, experts used the descriptions of information attributes from the records of the information system of the NSSI. On their basis on each field of the SED, which is recognized and has a hit in a record, a tabular descriptions is made, as indicated in the figure below:

The fields with a choice are analyzed similarly, as they have the possibility at choice of different options of having a choice from different data sources.

Determination of the sources of data bases

Based on the SED analysis, the database from which to extract data are determined:

• NDB "Population" of DG "CRAS" – this information is used most frequently. Data are needed both for the names of the person, the address, their civil status and data on kinship in some SED;

• Base of granted pensions – this information is also used actively. It is used to retrieve the names of the person granted a pension, the date of granting of the pension, etc. Data of the names is loaded into the same fields in which data is loaded for the names from the NDB "Population" and this was taken into account in the development of the procedures for extraction of data and the relevant procedures or WEB-services;

• Register of employment contracts;

• Register of insured persons – data on the insurance of persons;

• Register of insurers;

• Register "Unemployment cash benefits" ;

• Register "Cash benefits and benefits from SSS";

After determining the databases, the means to be used to extract the data are set. In some cases, it is sufficient to use SQL Stored procedures to ensure a higher performance and flexibility, while in others, Web-services are needed in order to implement logic that is not technologically possible to describe in a procedure.

Analysis of the flow P002

In the analysis of this flow, a SED analysis of all SEDs in the flow is examined. The new versions of the documents are also analyzed. In order to facilitate the development of procedures, a comparative document from the SED - analysis of all documents in the flow is drawn. Compliance with the sections in the documents is sought in it. Identical sections are determined. The differences in data extraction are also determined in them, because a different set of data is required in identical sections. For example, data about the person in some SEDs does not require civil status and previous names, as shown in the following illustration:

The priority databases in the flow are determined:

• NDB "Population" of DG "CRAS";
• Register of granted pensions;
• Register of insured persons;

For these databases procedures are developed and interfaces for connection with them are determined.

Example of an interface in the register of insured persons in the NSSI (RIP):

Input parameters of the function - **SEDGetStajForEGN**
@egn as char(11),@day as tinyint,@month as tynyint,@year as smallint
Description of parameters
@egn - PIN + Flag for Bulgarian - 0 or foreigner - 2
@day as tinyint,@month as tynyint,@year as smallint – day, month and year of the date contained in the periods.

The following result is returned as Recordset:

Field	Name	Designation
BULSTAT	Bulstat	For information of the employee
BULSTAT_name	Name of Bulstat	For information of the employee
BULSTAT_address	Address of Bulstat	Not necessary for the needs of P2000
EGN	PIN	For information of the employee
TypeOfInsured	Code of type of insured	For information of the employee

TypeOfInsuredDescription	Description of type of insured person	For information of the employee
WorkedHoursForDay	Daily work time in hours of the insured person	For information of the employee
WorkHours	Законоустановеното работно време за	For information of the employee
WorkHoursForWeek	Work hours per week	4.1.6 Hours per week
Kategory	Labour category of RIP 1,2 or 3	For information of the employee
StartDate	Start of the period	4.1.3 Start date of intended employment or self-employment
EndDate	End of the period	4.1.4 End date of employment or self-employment
OsigDohod	Cumulative insurance income for the period	Not necessary for the needs of P2000
Amount	Amount – monthly	4.1.7.1 Amount
StartDateAmount	Start of the period of payment	4.1.7.3 Amount effective since

Example of verification whether the person receives a pension:
Verification whether the PIN is available in the database "Pensions". Parameters to be checked are PIN and date on which the inspection takes place.
If a person receives a pension, the returned the result is:

Decision for pension
PIN
First name
Middle name
Last name

Type of pension. The type of pension has the following values:
    0 – Pension for accident at work or occupational disease
    1   – Invalidity pension
    2   – Pension for insurance and old age - Old-age pension
    32 – Pension for insurance and old age - Survivor's pension

Start date
Period of pension – For information of the employee. '9999/01/01' – lifelong pension
Amount of the pension
Status of the pension (paid / stopped payment)
Date of report

If the person does not receive pension, the returned result is:

MSG = "No data of the person in database Pensions!"

Example of extraction of information for invalidity:

Data is extracted from database Pensions

Type of invalidity
Date of occurrence of invalidity *(determined by the pension institution)*
Degree of invalidity

Extraction of personal data for a person

There are three ways to search and extract information:

1. There is provided information about PIN.
    • The data are extracted from NDB "Population" of DG "CRAS". Here is an option for filling the missing attributes or correction of the visualized ones;
2. There is information on date of birth and three names of the person.
    • A a search will be done in NDB "Population" of DG "CRAS".
    • In the presence of the matches, a list of persons will be shown from where we can move on to item 1;
3. There is information about PIN.
    • Data will be extracted from the database "SED". This will be possible for persons who are already registered in the system;

Personal data
PIN
First name
Middle name
Last name
Date of birth
Sex
Citizenship
Flag (alive/dead)
Names of the father
Names of the mother
Information about death
Date of death
Current address
Street
Town
Postal code
District
Country

Permanent address
Street
Town
Postal code
District
Country

Extraction of family connections

The data are extracted from NDB "Population" of DG "CRAS".

Type of connection - spouse
PIN
Names *(first, middle, last)*
Type of connection - parents
PIN
Names *(first, middle, last)*
Type of connection - children
PIN
Names *(first, middle, last)*

Extraction of insurance periods in the Republic of Bulgaria

Data is extracted from database "Pensions" / "Report of service and income".

Includes all periods of service counted for pension under Bulgarian law.

Period	Duration of service
from (dd/mm/yyyy) to (dd/mm/yyyy)	...yy ...mm ...dd ...h
All:	

Months or insurance service for right of pension - xxx
Months or insurance service for amount of pension - xxx

Period	Insurance income
from (dd/mm/yyyy) to (dd/mm/yyyy)	... BGN

IV. Organization of infrastructure

By creating a foundational IT infrastructure on which Global Directory and Authentication Service to be deployed, what is intended is to update and improve business processes in the NSSI. Its implementation will radically change the provided IT services at the time. Duplicate services will be simplified and eliminated.

Located on a new generation of servers, the new IT infrastructure in the NSSI will be almost fully virtualized with the Hyper-V technology of Microsoft. This will allow much greater flexibility in the provision of additional resources for the services provided.

The new internal Domain of the NSSI will provide a unified authentication of all users in

the system for all integrated Microsoft Windows services, such as Microsoft Exchange, SharePoint, etc. of the existing internal systems of the NSSI and applications of external providers.

The structure and environment of the new Active Directory in the NSSI is based on the concept of one Forest / one Domain. The new Domain NOI.NSSI.BG was created, which is supported by two Active Directory Domain Servers, which are installed as virtual machines and are located on two separate host servers. Functional level of domain noi.nssi.bg is Windows Server 2012.

With the purpose of delegation of rights and implementation of different policies, Organization Units (OU) are designed. OU are a very flexible way of implementing these policies. OU have two main functions: the application of Group Policy for Active Directory objects and the provision of Administrative Delegation. The OU structure allows very good and structured way to delegate administrative permissions by using native Active Directory tools such as DSACLS utility. Maintaining the OU structure in a consistent state, adhering to the best practices for naming, will lead to its easy operation and maintenance.

Two main OU are created – "**_Service and Admin Objects**" and "**_Branches**"
- **_Service and Admin Objects** - This OU contains only objects that are associated with IT administration and Service Management. It includes: service accounts (for different systems and applications that are necessary for AD DS authentication or impersonalization), server account object, administrative user accounts (including domain administrator accounts), other specific groups, etc. Access to this level have only members of the domain admins.
- **_Branches** – This level will perform a logical connection between the root node and all 28 sub OUs for all TO of the NSSI and the Headquarters of the NSSI. This division will allow easier and purposeful management of GP (Group policy) to various TO of the NSSI and the Headquarters of the NSSI, where everyone may have different requirements (in accordance with the attached GPS).

  ♦ **XXX, where XXX is a three-letter identification of TO of the NSSI** - these OUs will be for other OUs, which contain relevant AD objects and resources;
  o **Resource OUs** - these OUs are lowest level and they contain AD objects and resources such as: delegation groups, group, user accounts, Computer and serves;

In **Resource OUs** 5 sub OUs are created:
- **User Accounts** – here are all users for the respective TO of the NSSI;
- **Computers** – here are all PCs for the respective TO of the NSSI;
- **Servers** – here are all servers, situated in the respective TO of the NSSI;
- **Groups** – here are all specific groups for the respective TO of the NSSI;
- **Delegation Groups** – 5 groups are created here;
  ♦ **XXX Account Admins** – members of this group have rights only to create and manage users for the respective TO of the NSSI;
  ♦ **XXX Computer Admins** – members of this group have rights only for the computers for the respective TO of the NSSI
  ♦ **XXX Server Admins** – members of this group have rights only for the servers, situated in the respective TO of the NSSI
  ♦ **XXX Group Admins** – members of this group have rights only to create and manage groups in the respective TO of the NSSI
  ♦ **XXX Regional Admin** - members of this group have the highest rights in

the respective OU. All other groups in Delegation Groups are members of this group, respectively, this group has all the rights of the other groups;

Upgrade of mail servers to Microsoft Exchange 2013

Currently, the NSSI uses Microsoft Exchange 2003 and Exchange 2007 for major mail servers. To implement high availability and disaster recovery features along with a rich set of new features, the implementation of Microsoft Exchange 2013 is planned. Here the basic problem is the smooth migration of existing user mailboxes in order to preserve the existing features and the acquisition of new ones.

The main objective of the new solution is to provide a reliable and robust system for exchange of messages that will improve performance and reduce funds for its maintenance.

Currently, the NSSI does not provide access to e-mail to mobile devices, as the goal is for the new infrastructure to allow mobile devices to use Microsoft Exchange ActiveSync. Exchange ActiveSync is a communication protocol that allows mobile access to write messages, for scheduling of data, contacts and tasks.

Microsoft Exchange 2013 is located on a few virtual servers.
• Two virtual servers for the Mail Box servers working in Database Availability Group (DAG), which provides automatic database-level recovery from failures. Each DAG servers contain a current copy of the mailbox database from the other server so that in case of dropping out of any of the servers, the other can take the functionality;
• Client Access Servers (CAS) are front-door for all Exchange services to end customers. Without proper planning and adequate access to services by CAS, users will have either poor service or no access to their mailboxes. To ensure continuity of service, here also two virtual servers running in Network Load Balancing (NLB) are planned in order to evenly distribute the load of the requests to them;
• The central site will function as an input-output point for SMTP communication. The first line of defense for SPAM and content filtering for e-mails from the Internet will be Exchange Edge servers. For them, two virtual servers are also raised;

V. Glossary

1. **What is EESSI?**

• EESSI(**Electronic Exchange of Social Security Information**) is an information environment, through which social security (insurance) institutions in Europe will be able to share information more quickly and more securely as required by EU regulations on coordination of social security.
• **Structured Electronic Documents (SED)**
o through structured electronic documents (SED), communication between national authorities is implemented on files for cross-border social security, it will be done through structured electronic documents. EESSI, administered centrally by the European Commission, will provide access to those documents to the correct destination in another EU country. Employees in the social security authorities will be able to find the exact destination in another European country with the help of a registry of national authorities.

- **Benefits from the EESSI**
  - o For citizens:
    - ■ faster processing of requests
    - ■ faster calculation and payment of benefits

  - o For state administration:

    - ■ Standardized paperless flow of information
    - ■ better multilingual communication through common structured documents
    - ■ optimized data inspection and collection

2. **Structured Electronic Documents (SED) and flows**

- **Definition of SEC in electronic version**

  - o "document structured in a format designed for the electronic exchange of information between Member States"

In the most general case, SED is a document with a predefined structure described in XML.

- **Flow**
  - o "a set of pre-defined structured and unstructured documents for processing a specific case"

In the EESSI system, information is exchanged by sending structured electronic documents (SED) in predefined flows. A flow combines all SEDs used to process the pension case.

Examples of pension flows:

- F-P002 Pension claim old age
- F-P003 Pension claim – survivors
- F-P004 Pension claim invalidity

3. Access Point (AP)

This also is a point of contact with the European network sTesta. AP can be a hub for several institutions.