Statistical Data Collection and Processing System MtS-ISL-SUD-SDNS

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Summary

For data description, data collection and data processing, the Czech National Bank (CNB) uses a robust, sophisticated and universal system called "MtS-ISL-SUD-SDNS". The system is used by all respondents for sending all required reports to the CNB. The MtS-ISL-SUD-SDNS system not only describes the required data, but also presents methodologies containing information described for a given time period for any respondent in user-friendly form on the CNB website and also provides respondents with a structured form for electronic processing. The application performs many checks, stores correct data and informs respondents about data processing results. The system enables respondents to fulfil reporting duties with the aid of SDNS free of charge. It supports users selecting data and also programmers preparing specific end-user applications.

1. Introduction

The Czech National Bank is the central bank of the Czech Republic and the supervisor of the Czech financial market. In accordance with Act No. 6/1993 Coll.,[3] on the Czech National Bank, the Czech National Bank is responsible for supervision of the financial market in the Czech Republic. The CNB therefore supervises the banking sector, the capital market, the insurance and pension scheme industry and credit unions, as well as performing foreign exchange supervision and supervision of electronic money institutions. The CNB lays down rules safeguarding the stability of the banking sector, the capital market, the insurance industry and the pension scheme industry. It systematically regulates, examines, assesses and, where appropriate, issues penalties for non-compliance with these rules.

The Czech National Bank in its area of competence compiles and publishes statistics, in particular monetary and financial statistics, balance of payments statistics, financial accounts statistics and government finance statistics. The individual statistics are compiled in accordance with international standards and standards of the European Union. The EU Treaty requires the European Central Bank, assisted by the national central banks, to collect the statistical information necessary in order to undertake the tasks of the European System of Central Banks.

To meet these objectives the CNB has a number of data collection systems at its disposal. The largest is the MtS-ISL-SUD-SDNS system. The system – Metadata System **(MtS)** – Information Service **(ISL)** – Statistical and Accounting Database **(SUD)** – Data Collection from Non-banking Institutions (SDNS) – is a specific and very sophisticated fully automated information system for receiving and processing data. This system is used for collecting and processing data from entities obliged to report to the CNB. The CNB is entitled to issue methodologies for each group of respondents usually once a year. Data collection in every business area is based on a good legal framework; the CNB has issued a "provision" (regulation) for banking institutions and decrees for non-banking institutions. These lay down the methodology and general framework of rules and procedures concerning automated reporting.

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2. Main Features of the System

The main features of the system are as follows:

- The system is general and exclusively controlled by metadata. This gives it significant universality and also applicability to various types of statements, reports, etc. Almost all information can be described through the Metadata System module, which does not need to be connected with data collection.
- The Metainformation System has brought considerable progress in working methods. For example, the introduction of new statements and changes to existing statements does not necessitate intervention by a programmer, but only require the involvement of a designer-methodologist, i.e. a specialist in the business area qualified in the use of the system.
- Nearly full automation on the part of the CNB.
- The system's universality and the constancy of its basic rules have enabled a significant level of automation to be achieved by reporting agents too. As regards banking institutions, there is now nearly full automation in the statement compilation process. The situation is similar with regard to some non-banking institutions, especially insurance and investment companies.
- The system is integrated for all statements and data.
- On the other hand it is a distributed system. For preparation and communication with the CNB the respondents, especially banks, use their own systems created on the basis of interfaces defined by the CNB (data, communication, security, processes and organisation).
- The use of standards (EDI, XML).
- A high level of data security.

3. History of the System

The first version of the MtS-ISL-SUD system was launched in the second half of 1995. Operational use of the systems gradually started from then onwards. Fully automated data collection from banks started at the beginning of 1997. Between 1998 and 1999, after evaluation of the experience and thorough analytical preparation, a second version of the system was created. This new version took into account a rapid increase in data requirements, especially requirements for data and metadata quality, and not only for internal purposes, but also for fulfilling ECB requirements (as from 2004) and new requirements following the integration of financial market supervision (as from 2006).

Between 2001 and 2003 an internet channel for non-banking institutions (SDNS) was added to the system. In 2007 the SDNS-Web-Services interface was added.

4. Description

The MtS-ISL-SUD system consists of the following main subsystems;

- ***Metainformation System*** **(MtS)** – forms the basis of the system. A Reporting Methodology has been defined and created. The metadata created are used by other components of the system.
- ***Information Service*** **(ISL)** – informs respondents about methodology, ensures comprehensive data collection, performs data checking, informs respondents about processing results and sends out reminders.
- ***Statistical and Accounting Database*** **(SUD)** – contains its own database (data and metadata) as well as tools giving end-users or end-applications access to the database (STRUKT proprietary applications, standard programmer interface (SQL) and standard views).
- ***Data Collection from Non-banking Institutions*** **(SDNS)** – used to collect statistical data of smaller volume and submitted less often, i.e. primarily from non-banking institutions.
- ***Organisational Model*** – enables the setting-up and updating of access rights for users for using the system and performing data selection; contains operational and organisational data about reporting agents and their users to ensure operation of ISL.

4.1 Metainformation System (MtS)

The core of the system is the "Metainformation System", i.e. a system containing information about processed information.

MtS has two basic tasks:

1) It informs CNB users and all CNB reporting agents and other interested persons about the methodological description of statements and also about respondents' reporting duties.

2) Thanks to the precise formalisation of the methodological description of financial reporting and the description of information, the system actively uses this information for its own activity. The metainformation can also be actively used by other applications which take data from the system and carry out subsequent specific processing for groups of users (see Standard Programmer Interface).

It creates a methodology. The methodology contains a detailed formalised description (in economic terms) of all the items in all the reports which respondents must send to the CNB, and other important information necessary or suitable for the proper functioning of the system.

Metadata are divided according to the type of data or reporting agents into "Business Areas". Every Business Area contains the requirements of the relevant group of reporting agents and can contain the same or similar types of statements.

The system currently contains the following 13 Business Areas:

- Banking Industry
- Information Service (only for technological purposes)
- CNB – Internal Reporting
- List of Codes (only for technological purposes)
- Funds
- Portfolio Investment
- OFIs – Other Financing Intermediaries
- External Statistics
- Pension Scheme Industry
- Insurance Industry
- Brokers
- Credit Unions
- Capital Market Monitoring

For every Business Area there is a series of methodologies following each other in time.

The Business Areas are relatively independent of each other. However, it is desirable to share metadata created in other business areas if possible.

The descriptions of each object are based on matter-of-fact descriptions (so-called "semantic descriptions"). The semantic descriptions use the following objects:

- List of Codes
- Dimensions – Parameters
- Data Types
- General Economic Indicator = General Variable
- Reporting Duties
- Data Set (statement),
- Data Area (table).

Except for Data Set, every object can be shared. The shared objects are mostly included in the special "List of Codes" Business Area. All the shared objects, such as the List of Codes, Parameters and Data Types, which can be used for the description of the methodology of any Business Area, are stored in this Business Area.

The methodology description is based on a semantic description of every object. Definitions of general economic concepts – so-called General Economic Indicators – are used for this purpose. An item from the chart of accounts can be used for the description of General Economic Indicators. These general indicators are specified using some appropriate Parameters. The Parameters can be defined with the aid of some subsets of the List of Codes (so-called domains).

The described data are grouped into a **Data Area** (in graphical terms this is something like a table). If parameters are not specified by a constant they create the Dimension of the Data Areas (in graphical terms the axis of the tables). Data areas can be one-dimensional (only a row or a column), two-dimensional or multidimensional. The data are specified by data types (the format of the data determines, for example, whether this is a number, text, a number of decimal places or a specific code such as ISIN or BIC). In addition, there are the defined measurement units in which the data are collected or presented.

The Data Areas are further grouped into special purpose units called **Data Sets (statements)**. The Data Sets can be either "input" ones (their data are collected from reporting agents) or "output" ones (the system can fill them using data stored in the database). Every statement must be qualified by occurrence parameters: the entity (WHO is transmitting the data), the date (for WHAT period) and the range of reporting (data compiled for the Czech Republic or for the whole world).

Image 1: Metasystem Objects
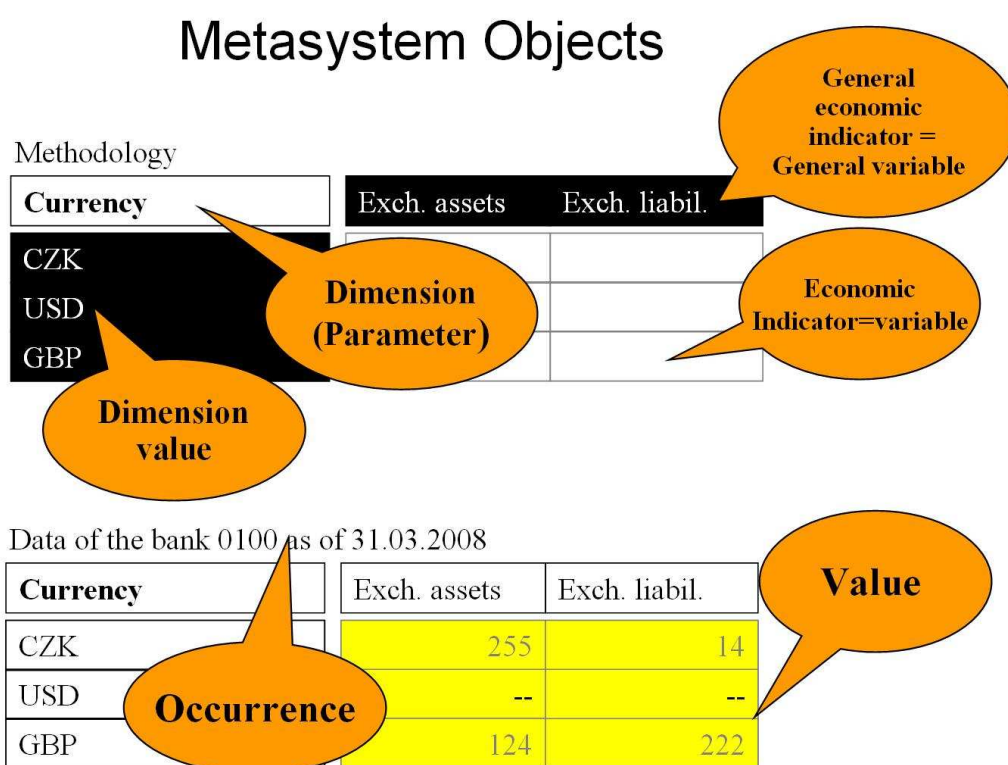
A user having the application role of a designer defines all the objects and necessary logical control expressions which must be fulfilled by all the values.

There are three types of such control expressions:

- internal report checks (operands are items of the same report)
- inter-report checks (operands are items of two or more reports or of two or more instances of the same report in various time periods),
- time series checks (the values of the data should lie within a confidence interval derived from previously sent data).

From control processing and further activities we can distinguish the following types of checks:

- error – data must be corrected,

- suspicion – some values are suspicious but it is not certain that they are really incorrect. The respondent must check them and send either a correction or a confirmation,
- warning – some values are suspicious but according to the bank they are treated as correct. The respondent is not informed and does nothing,
- information – only defined, not processed.

The MtS application supports the creation of the methodology in all phases of its production. For example:

- it provides a complete list of all metaobjects with all their details and their use;
- on the basis of already created metainformation it enables automatic generation of the majority of internal and inter-report checks. There is a helpful tool for creating checks (Wizard). Internal report checks and inter-report checks are defined in so-called semantic language, which means that individual operands are described by means of their matter-of-fact characteristics. Semantic language is especially suitable because the checks defined in this way are not dependent on statements in graphical form and are therefore stable over time. The system enables checks to be translated from semantic language into an easily understandable user language where operands are determined by their position in the statement (data area, row and column); this is more user friendly;
- in simple cases the system itself is able, on the basis of matter-of-fact description, to tie current data to data under a previous methodology. In more complicated cases this requires manual work by a system designer supported by the system;
- it includes data-sharing control tools;
- it provides necessary information for controlling and coordinating the projection process;
- the final steps of creation of every methodology involve the execution of controls before coming into force (validation) and final coming into force (validation). Controls before coming into force check the consistency and completeness of the given methodology and identify the existence of duplicate data (data in separate statements that are defined in the same way).

The MtS application provides users with information about all methodologies created. Besides this application, accessible only to CNB users, methodological information is provided to users in the following ways:

- via an electronic report "Description of CNB Metainformation" in UN/EDIFACT format (see section 4.2 Transport Layer). This is intended for banks. The content of this message is first of all assigned to a methodology transformation into a form that needs banks' SW tools for data preparation and optionally for methodology presentation in a form designed for their workers;
- the internet-oriented SDNS application (see section 5. Data Collection from Non-banking Institutions) provides users with all substantial methodological information in a clear and intuitive form. This information is publicly available;
- through so-called web-services technology the SDNS application enables users to obtain the methodological information required for automated statement data preparation in an application of the reporting entity;
- the standard programmer interface (sometimes "IC interface") – see Standard Programmer Interface – enables other CNB information systems to select information of a methodological character.

Besides the above-described creation of the methodology for input statements it is possible to define a methodology for output statements as well. Output statements can include both data collected in input statements and data derived by calculation of other values. This enables the creation of a purpose-made application for end-user requirements.

4.2 Transport Layer

The Transport Layer is a suite of software tools mainly ensuring communication services, conversion and security services needed for transmission of messages sent from banks to the Information Service application (see section 4.3 Information Service) and vice versa. The whole solution is based on the principles of a so-called Electronic Data Interchange ("EDI") running automatically between applications for preparing data in banks and the ISL application at the CNB. The reason for the implementation of the Transport Layer is that banks use their own systems for preparing data and sending it to the CNB. Moreover, the possibility of having a high level of automation was envisaged

from the outset. The concept – where one part, which can be solved by all the included parts and for which there are proven standards and commercial software products, can be pulled out – simplifies the problem. For this reason, and also due to the potential to use it for other purposes as well, the Transport Layer was pulled out of ISL.

The basic SW components are:

- ISOPLEX MTA (Message Transfer Agent) X.400 – ensures electronic communication by application protocol X.400.
- ISOTRADE AU (Access Unit) – contributes to MTA functionality. It is an interface between MTA and other applications. It supports transmission and confirmation of EDI messages (a recommendation of standard X.435) and in particular creates service messages sent to the sender (so-called positive and negative notifications);
- CEDI (EDI Message Server) – controls SW that coordinates many general functions, especially:
  - deciphering of messages received,
  - checking of electronic signature of messages received, electronic signing of messages sent,
  - conversion from UN/EDIFACT format to internal format of end-application ISL and vice versa,
  - storage of messages,
  - message delivery to ISL;
- EDISEC 2 – ensures performance of security functions connected with messages received or sent;
- EDISEC CA – performs functions necessary for performing the function of Certificate Authority, especially the generation of public key certificates. The CNB performs the function of Certificate Authority in this case;
- Gentran Server – used as a universal convertor of messages from UN/EDIFACT format to internal ISL format and vice versa. For transmitting messages a standard UN/EDIFACT GESMES ("Generic Statistic Message") is implemented for sending methodology, statements and reminders, and BANSTA ("Banking Status") is implemented for sending processing results.

Banks use the same or similar products corresponding to the defined data, communication and security interface.

4.3 Information Service (ISL)

The Information Service application informs respondents about methodology, carries out communication with them, comprehensively ensures data collection, performs data checking, informs respondents about processing results and sends out reminders. In particular, the Information Service performs so-called mass actions. These are actions which by their nature cannot be performed interactively (they are performed automatically in the background) or which are so computationally demanding that interactive performance would not be appropriate. Mass actions mostly involve processing of messages received containing respondents' data and some operations concerning methodology formation. About 100 actions are defined in the system. Here are some examples:

- Preparation of data collection and data processing schedule,
- Automated pre-processing of message received,
- Automated processing of message received,
- Verification of relationships between statements,
- Reminders of statements and checking,
- Creation, checking and validation of new methodology,
- Methodology broadcast to reporting agents,
- Time series update,
- Secondary data computing.

Mass actions are performed in batches. If necessary, more than one batch can be performed simultaneously. Some mass actions are started by users (this is typical of actions connected with the preparation of new methodology). All actions can be started by an operator, but most are planned for a defined date and time. The mass action "Automated pre-processing of message received" is started

itself by an event (receipt of message). The action "Automated processing of message received" is started by the pre-processing of a message received.

The action "Automated pre-processing of message received" finds out what statements are contained in the messages, which respondent has sent it, and the date as of which the statements have been compiled. On the basis of this information, messages are grouped into a batch under defined rules. One criterion, for example, is the priority of the statement. One or more messages can be processed in one batch. Having a greater number of messages in a batch contributes to processing efficiency. On the other hand, it is not appropriate for respondents to wait a long time for the processing result. The number of messages in the batch is determined (taking into consideration the current system load) so as not to exceed a defined limit.

During the processing of messages received, the Information Service always cooperates with the methodology corresponding to the business area and the date as of which the statement is compiled. Many checks are performed as part of the data processing of messages received:

- Heading checks,
- Checks of whether the structure of the message corresponds with the methodology,
- Checks of right data formats,
- Checks of fulfilment of logical validation rules,
- Checks of whether some representative values in the processed message correspond with the values sent before for the previous period (time series statistics tests).

Then the data processing continues with:

- Broadcasting of processing results for every message,
- Storage of correct data in the database,
- Operational statistics update.

Data corrections are performed by sending a corrective message with all values of the whole statement. Corrective message processing is the same as message processing with new data. The corrected values are rewritten on the logical level with the new values, but all values are available in the database.

In the case of banks, messages containing the processing results are sent in UN/EDIFACT (BANSTA) format. The recipient is the application at the bank. The way users in the bank are informed depends on the characteristics of the bank's application. In the case of non-banking respondents (see section 5. Data Collection from Non-banking Institutions) the processing results are sent by e-mail.

Reporting agents are obliged not only to correct mistakes in the data, but also to correct data they later find out to be incorrect.

The schedule for data collection and processing, created on the basis of methodological information, is used for reminders. If statement data are not received by the deadline or are incorrect, the reminder process starts. The system creates three levels of reminders. The reminders are sent in UN/EDIFACT format for banks and by e-mail for non-banking respondents. Every reminder contains the date by which the data must be sent or corrected. The reminders can be repeated if necessary. Higher-level reminders are sent to the person responsible for financial reporting.

If the data are not made available by the deadline, the system automatically copies the last received data to the current period as substitute data (duplicate data). This action enables the creation of an aggregation estimate before the real data are sent.

The Information Service performs inter-statement checking several times daily. The application verifies whether the relationships between two or more statements have been fulfilled. The respondents are informed about any errors. Reminders are also issued for errors not corrected within the set time period.

On the basis of the current operational characteristics, the application derives a quality indicator for the data saved in the SUD database (1 – perfect, 2 – 9 more or less serious errors, 0 – data not received or not corrected or to be cancelled), which is available to end-users in the CNB and can be used as a characteristic of applicability within a set time limit.

The Information Service also calculates secondary data according to an algorithm created with the aid of the methodological description of primary/entry data and with the support of the system. These data

are used by many output applications. The new secondary indicator can be calculated for the whole past time period up to the present and is then regularly calculated in every current period.

In special cases the MtS-ISL-SUD system enables processing of messages received in an alternative way in cooperation with an external application (external information system):

- Control can be turned over to the external application for further specific checking; the Information Service is then informed about the results.
- Data are not necessarily saved in the SUD database.

Information about all mass actions, including their running and results, is logged and can be used for analyses if necessary.

The Information Service application contains numerous functions for planning and operation monitoring. Operators and all users in the CNB can also use various statistical surveys, for example surveys of reporting duty fulfilment status, error rates and message processing.

4.4 Statistical and Accounting Database (SUD)

The Statistical and Accounting Database is implemented in Oracle 10g. The Database contains all metainformation, the values of the statements and other supporting information, and also operational information, etc. The SUD database contains both numeric and text values as well as dates. The text values in the statements are limited to 250 alphanumeric characters. Documents (i.e. Word documents) are not stored in the SUD database.

A fundamental characteristic of the database is the absolute independence of its structure from data types or transporting data structures; all these factors are arranged by methodology

The statement can be compiled in units (units of EUR, units of CZK, etc.) or in multiples of units (millions of CZK, thousands of EUR, etc.). The data are always stored in the database in units. If values are updated in the correction process, all the values that are different from the previous ones are stored in the database. The previous values are designated as cancelled values. Duplicate data are also stored in the database. The values of cancelled statements are assigned a quality rating of "0" (not valid at present). We can further distinguish between values sent before an audit and those sent after it and between operational values and testing values. Although users mostly use the latest (current) values, they can also select any value valid in any previous period.

4.5 Outputs

a) The STRUKT application supplements the Metainformation System (MtS) (see section 4.1 Metainformation System) with a graphical presentation of the statement structure. This enables interactive projection of the content and structure of input/output tables and linking-up of time series.

The main role of the STRUKT application is to enable a user to select data stored in the database. The set of data available to users depends on the user's access (access right) – see section 4.6 Organisational Model. Generally, a user can select an optional business area and choose an optional defined methodology in the business area. The user specifies if he or she is interested in an input or output statement as well. After the data area (table) of the selected data set (statement) in the structure is displayed, it is possible to display either:

- important methodological information for users that is essential for correct data interpretation that corresponds to the constituent statement's cells, e.g. multiple, relation to an account in the chart of accounts, data character (input, shared, calculated, deleted), binding data in a string that forms a time series, or
- values of individual tables of a specific statement that are displayed for a specific entity, a specific date and for a so-called range of reporting. It is possible to choose, for example, between proper (operating) and testing data, and between detailed data for a particular entity and data aggregated across all entities or different subsets of entities. It is possible to perform an aggregation over a selected period of time. In addition to displaying the last valid values it is possible to display whatever period of time (data and time of modification of a statement's values in the database) relative to any time and date in the past. In all other cases users have

numerical information about data quality. Queries that are considered by users to be multi-applicable can be saved and reused in a simple way.

A special type of output is so-called output diagnostics. The output diagnostics display information about data availability, replication or inaccessibility for a specific set of entities, date, etc. Such information has a fundamental bearing on the interpretation of the aggregation. Furthermore, it is possible to display selected data from statements in different time series formats.

STRUKT enables tables to be exported into Excel. There are different parameterisation options. In particular it is possible to export:

- empty statement tables (only rows and columns designation) that are generated by the system, possibly supplemented with methodological information, including the relation to the chart of accounts,
- tables with selected data (detailed, aggregated, etc.) in selected multiples and value formats,
- values of time series,
- time series depth information, including help information.

b) Standard Programmer Interface (SPR)

The Standard Programmer Interface is a set of 37 generated database objects (tables, views) with two main purposes. The first is to provide easier access to data and metadata for programmers of subsequent applications and to users' operational data information saved in the SUD database. The second is to guarantee increased data security (the interface does not enable changes in the content of the database). Current data are guaranteed by standard functions in SPR. Unlike the data model, which can change, SPR is stable over time, so it is not necessary to update subsequent applications.

1) Fundamental SPR objects:

- methodological (Data Sets, Data Area, dimension of Data Area, Data Types, List of Codes including item and domain),
- description of structure (data of Data Area, …),
- data value,
- organisational (reporting duties, occurrence of data sets)

2) Supportive SPR objects:

- quick search,
- definitions,
- user access rights.

SPR enables either direct on-line access to full current information or occasional pulling (data pumping) into subsequent application environments.

c) Other data access options

Other data access options create so-called user views. A user view is a database object which can be generated for every data area (table) of a statement in the MtS-ISL-SUD system when each method is due. The views provide the user only with data values. They are very simple for programmers and users to use; all that is required is some SQL language knowledge.

4.6 Organisational Model

This application ensures functions connected with the register of information about reporting agents, external and internal users, access rights and so on. The information of the Organisational Model is used by operators and a selected group of other users, and some information is used by the system itself for operation.

For external entities, their identification codes, names, attributes such as CZ_NACE or ESA95 codes, addresses, telephone numbers, e-mail addresses and so on are stored. For all external users, their names, telephone numbers, e-mail address, external access functions for using systems and information for registered access to SDNS and SDNS-WS (Entrust profiles or user-codes/passwords and public certificates) are stored (see section 5 Data Collection from Non-banking Institutions).

Respondents can send reports themselves, which is the usual case, or they send them with the aid of another entity (a so-called communication entity or submitter); this information is also stored in the Organisational Model.

External users from non-banking institutions need to register to use the SDNS application in the Organisational Model in order to avoid registered persons having to be personally present in the CNB wherever possible. However, the registration process must be as safe as possible. Lists of persons and their basic information prepared for registration are received in electronic form from sections responsible for groups of respondents. During the registration process the information is checked and is then accepted into Organisational Model by the SDNS application website. In return, information is sent from the Organisational Model to the registered person by e-mail. The result of the registration process is either a so-called Distinguished Name (in the case of use of ENTRUST certificates) or a user code and encrypted password and moreover the export of a qualified certificate (in the case of use of a guaranteed electronic signature based on a qualified certificate), depending on the SDNS logon type and signature used. The Organisational Model also contains necessary lists, a registration history, detailed information about the present security status of users, and security administration tools.

For internal users, their names and internal access functions for using the system (e.g. methodology designer, methodology administrator, classification administrator, ISL operator, Organisational Model administrator and user) are stored.

Access right administration is a very important part of the system. Normal users only have access to values needed for their work. Four types of access are defined in the system:

- full – without constraints; a small group of administrators has this type of access,
- specific; users have access only to some business areas or only to some statements or only to parts of statements; this type is the most common one,
- public; users have access only to aggregations of some entities,
- none; users have access only to methodological information and no way of selecting values.

The Organisational Model enables database accounts to be created and cancelled and passwords to be changed.

For easy administration of the large number of users (external and internal) the Organisational Model contains many object overviews and print reports.

All the information is saved in the Organisational Model in a time context, and the status can be determined as of any given date.

5. Data Collection from Non-banking Institutions (SDNS)

The SDNS application was developed for data collection from non-banking institutions, where a smaller data extent and lower frequency – and consequently a zero or low level of automation on the respondents' side – was envisaged. It was also necessary not to force respondents to create their own solutions and not to incur large expenses connected with data collection. The solution is therefore based on internet technologies; users need only a personal computer connected to the Internet and equipped with MS Internet Explorer.

From the viewpoint of the MtS-ISL-SUD system the SDNS application is a further input-output channel which is another alternative to the EDI channel in the case of less extensive reporting duties. In the case of extensive reporting duties, extension of SDNS-Web Services is also appropriate in addition to the EDI channel.

All communication between the CNB application and the user's PC is encrypted.

Application handling is user-friendly, and only a short training session (about 2 hours) is required for users. The application contains a detailed user manual.

Public part of SDNS:

- Presentation of methodologies for all business areas. The methodological information is presented in structured form. Users have at their disposal:
  - a list of all statements of a given methodology, including details,

- graphical structures of tables,
- a definition of all validation rules inside statements and between statements in semantic and user form,
- information about code lists, the chart of accounts, etc.
- User manual, help line.

However, access to most of the application's functions requires registration with the CNB and user logon to the application. Users can log on with the aid of an Entrust certificate issued by the CNB and a password or with the aid of an assigned user code and password. After logon, users "see" only information related to the given reporting agent and its reporting duties.

List of basic functions of registered access:

- Presentation of methodology of all statements related to the respondent (analogous to public access),
- Presentation of data transmitting schedule. The schedule contains information on, for example, the date as of which the statement is compiled, the transmission deadline, including the time, the processing status, the time limit for correction, the results of checking, information about reminders, etc.
- Where a statement has irregular reporting duties, users can create transmission plans themselves.
- Data are typed into a form. All cells are connected to a detailed methodological description and a list of values where available.
- Users are supported by functions:
  - calculation of aggregate values,
  - performance of checks before sending data to the CNB.
- Besides the data-typing described above, it is possible to import data prepared in an appropriate XML format by a suitable application of the respondent. It is then possible to inspect and correct these data in SDNS in the standard way or to perform checking.
- A file in XML format is created from the prepared data. The messages prepared in XML format are mostly electronically signed. The signing obligation arises from the applicable legislation and the registration of users. There are two types of electronic signature in the system:
  - signature based on an Entrust certificate issued by the CNB,
  - signature based on a so-called qualified certificate issued by an accredited provider of certificate services. This option is in accordance with to the Electronic Signature Act in relation to public authorities.
- All prepared and, where relevant, signed messages are sent to the CNB to be processed.
- All processes in the CNB are performed in ISL.
- Users gain information about the results of processing in the CNB partly from a web form in SDNS and partly from a result message sent by e-mail.
- Users can also display data on all statements sent and accepted in the CNB.
- Users can display all reminders sent to them.
- Users can display all the information about users registered with the CNB in their organisation and display all contact information (addresses, phone numbers, e-mail addresses, etc.) (See section 4.6 Organisational Model). They have the option of inserting or updating information.

The SDNS application has defined access rights, which are granted to users during the registration process in accordance with their needs. Use of functions of the SDNS application can be effectively controlled by these access rights.

New statements, updates of existing ones, and all changes made in the MTS module are presented on-line in the SDNS after completion of the validation process.

An optional part of the SDNS application is a software interface between the server part of the SDNS application and the respondents' applications, implemented with the aid of web-services technology. This interface enables:

- Automated retrieval of basic methodological information and operating information (schedule, status, results, etc.). This information is intended for the respondent's application; it is fully up-to-date and enables the development of very sophisticated automated solutions able to react flexibly to methodological changes. Ten web services are defined.

- Automated transmission of messages prepared by the respondent's application in XML format, including an electronic signature, direct to the CNB. For this purpose one web service has been implemented. The use of these web services together with the possibility described in the previous point enables avoidance of the use of the SDNS application, which is not suitable for sending large volumes of data. However, it puts significant demands on fulfilment of all the details of the defined interface; normal users do not usually have to take care of that.

6. Current Development of the System

The system has been under development this year to enable it to collect very detailed data in line with current trends. The messages related to such statements can be extremely large, containing hundreds of thousands of rows. The first data of this type collected are in area of securities. The statement contains a list of securities in the possession of clients – the domestic and foreign securities of all bank clients (residents and non residents). The list, containing detailed information, is reported on a security-by-security basis. The latest innovation enables transmission of data divided into smaller technologically process able parts, but processed on the logical level as one unit. All the necessary checks can be performed on the respondent's entire data, and output applications which draw source data from the SUD database can be prepared in the usual way. Major changes have been made to the correction process. Data correction was previously performed by sending a new complete report (see section 4.3 Information Service). In the case of very large files, this type of correction is inefficient from the viewpoint of transmission and processing. Now only new, changed and cancelled values will be sent. Respondents will be informed in more detail about mistakes found, so that the whole process of obtaining valid data can be shortened. The collection of detailed data is now preferred to aggregate data collection because the system has been proved to work with detailed data. Processing of the new type of "divided" messages will be applied to records of client orders (brokerage houses' day books). For transmitting divided messages it will be possible to use the EDI channel and the SDNS-web-services interface, which are appropriate for transmitting large data volumes.

7. Some Facts

To conclude, here are some facts about the MtS-ISL-SUD-SDNS system:

- 13 business areas (specific or multipurpose data)
- 870 reporting agents
- 1,625 registered users
- 151 statements, 578 tables
- 5,150 economic indicators
- 650 secondary (computed) indicators
- 100 classifications (lists of values)
- Various reporting periods: monthly, quarterly, yearly, daily – CNB internally and capital market monitoring
- 90 GB database
- Data from 1993 to the present
- Thousands of time series

8. Conclusion

The CNB does not provide entities obliged to send data to the CNB with appropriate applications. It merely stipulates the data interface, communication interface and security interface which are defined by the MtS-ISL-SUD system and which sent data have to be compliant with. The CNB only provides "small" respondents with "small" reporting duties with the SDNS application.

All respondents – "small" or "large", banks or any other type of entity, with "small" or "large" reporting duties – use the MtS-ISL-SUD-SDNS system for fulfilling their reporting duties to the CNB.

All the information required by the CNB from respondents is described in the same way, so the respondents only have to develop or buy one solution in order to fulfil the CNB's requirements. CNB users preparing methodologies also use the same statement description tools.

The CNB uses a single system for data description, data collection and data processing from (nearly) all entities. The specific end-user applications draw data from the same source database.