Setting up data exchange between information systems that automate accounting at the enterprise

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Abstract. The developers of 1C offer a line of software products to automate the production processes of enterprises. 1C: ERP Enterprise Management and 1C: Salary and Personnel Management are the flagship solutions of 1C. In the course of the work, the difficulties that arise when it is necessary to synchronize data between the configurations of 1C: ERP Enterprise Management and 1C: Salary and Personnel Management have been analyzed. This article analyzes the functionality of the above products. An overview of the main elements underlying the mechanism for synchronizing information between 1C applied solutions is given. The process of data exchange and synchronization between the products 1C: ERP Enterprise Management and 1C: Salary and Personnel Management using the built-in tools of the 1C software platform is considered. The process of organizing interaction and data synchronization in the considered solutions is presented. Recommendations related to setting up and receiving synchronized objects are given. The analysis of the results is carried out, conclusions are drawn.

1. Introduction
The gaining momentum of universal digitalization has influenced both the pace of technology adoption and the methods of processing and storing data. Innovation has made it possible to build new forms of business models around digital platforms [1]. It is impossible to imagine high-quality and efficient business conduct without the use of modern information technologies and software tools [2]. So in large companies and firms the most acute issue is the automation of production accounting. In such organizations, the number of employees involved can be measured in hundreds, which creates the need for an effective payroll tool. The products of the 1C company act as such a tool [3].

1C provides a number of solutions for automating template accounting and enterprise management tasks. Developers of application configurations take into account international management practices (MRP II, CRM, SCM, ERP, ERP II, etc.) and the real needs of organizations.

"1C: ERP Enterprise Management” (hereinafter 1C: ERP) is a software product designed to create an integrated information management system for the activities of any company. The system makes it possible to automate key business processes, monitor the performance of an enterprise, organize the work of departments and services, manage resources, coordinate the work of departments, analyze the efficiency of the company and its individual departments [4].

"1C: ERP Enterprise Management” allows you to:

• work with applications for spending funds, form and approve applications, control the execution of payments;
• separate operational information about incoming and outgoing payments;
• conduct settlements with the bank for acquiring transactions;
• keep records of financial results (profits, losses) in the context of the directions of the enterprise;
• implemented mechanisms for planning and consolidating product needs.

The configuration also implements tools for managing the budgeting process, calculating planned indicators, and regulatory accounting tools.

In addition, the system allows you to organize control over material flows and consumption of resources that ensure the production, management and commercial activities of the enterprise. Cost accounting and calculation of production costs are carried out on the basis of operational accounting data.

Application "1C: Salary and Personnel Management" (hereinafter 1C: SPM) is a means of direct personnel accounting and payroll accounting in various kinds of organizations.

"1C: ERP" is a more complex system, which by default has a block for working with employees' salaries, however, production departments, as a rule, are separated from the administrative center of the enterprise and prefer to implement the "1C: SPM" separately from "1C: ERP". This form of organization gives rise to the need for data exchange between "1C: SPM" and "1C: ERP" [5].

Another case confirming the importance of data synchronization between these systems is the planned abandonment of the SPM and the transition to "1C: ERP".

The relevance of the issue and determined the content of this article, dedicated to the description of the process of exchange and synchronization of data between "1C: ERP" and "1C: SPM" solutions.

2. Materials and methods
Exchange plans are the center around which other communication mechanisms are grouped. An arbitrary number of exchange plans can be defined in one configuration. Each of the exchange plans defines a set of data that is supposed to be exchanged within the framework of this exchange plan. Along with a dataset, specific formats for the presentation of this data can be defined.

It is assumed that the data formats are based on XML, but due to the flexibility of the XML language and the presence of advanced tools for working with XML in the "1C: Enterprise 8" system, there is enough space for creativity in the field of data presentation methods.

Exchange plans can be divided into two significant components:

• messaging infrastructure;
• service of registration of changes.

Exchange plan data elements are exchange plan nodes, just as directory data elements are directory elements. Each of the nodes of an exchange plan designates a participant in the exchange of data for this exchange plan. One of the nodes corresponds to this infobase, and the rest correspond to other participants with whom this infobase can exchange data [6].

Data is transferred between nodes using messages. Messaging tools form the messaging infrastructure. Each message belongs to a specific exchange plan, has a specific sender node and a specific recipient node. The message cannot be sent to an unknown host and cannot be received from an unknown host. Each message has its own integer number.

The change registration service is designed to register data changes made by the "1C: Enterprise 8" system, so that when exchanging data, it will be possible to transfer not all data, but only the changed ones.

Thus, exchange plans define a set of mechanisms for organizing data exchange.

In 1C systems, universal data exchange mechanisms are applicable, which can be used both together and separately, in various combinations, to organize data exchange [7]. Other information bases of the "1C: Enterprise 8" system can act as software systems with which the exchange is organized. In this case, the information bases exchanging with each other can, in the general case, have different
configurations. In addition, universal data exchange mechanisms can be used to organize exchange with programs not based on the "1C: Enterprise 8" system. This is facilitated by the following factors:

- the data exchange format is based on the XML language, which is currently the generally accepted means of data presentation [8];
- the means of data exchange, due to their modular organization and high flexibility, can be used to organize a variety of data exchange schemes;
- the protocols offered by the data exchange mechanisms are simple and can be replicated in external software systems.

Synchronization of data between "1C: ERP" and "1C: SPM" is performed at the level of documents and reference information. By controlling the settings on the "1C: ERP" or "1C: SPM" side, it is possible to implement the following data synchronization options:

- one-way data upload;
- bi-directional synchronization of data selected manually or registered automatically.

The data exchange process is carried out by transferring information between programs in the form of text messages containing data in the Enterprise Data format, using one of the following methods specified at the stage of setting up a new synchronization:

- direct connection of bases located on one computer;
- direct connection over the local network;
- direct connection via the Internet;
- through a local or network directory;
- via an FTP resource;
- by email.

When used to transfer information from a local or network directory, an FTP resource or e-mail, XML files act as a container for the exchange message [9].

The process of creating a new data synchronization includes sequential execution of settings for each of the bases-participants of the exchange, and can start both on the "1C: ERP" side and on the "1C: SPM" side.

Before you start configuring data synchronization, you must perform preliminary actions in both configurations. In "1C: SPM" and "1C: ERP" information about those organizations for which it is necessary to synchronize data should be entered. Including must be filled in the settings of the accounting policy. Management and regulatory accounting currencies must match in both configurations. In "1C: SPM" information about the structure of the enterprise and the connection of the divisions of the structure of the enterprise with the divisions of the organizations must be correctly filled out. In "1C: SPM" information on the methods of reflecting wages in the accounting with mandatory filling in, depending on the expense account analytics of cost items, deferred expenses or other income and expenses, must be correctly filled out.

In "1C: ERP", the settings for reflecting documents in regulated accounting for expenses by item of expense must be filled in.

It is possible that the standard data synchronization rules built into one of the configurations are not relevant when synchronizing data with the current release of the corresponding configuration. When setting up a new exchange, as well as when the next update of any of the configurations participating in the exchange is released, it is necessary to control the relevance of the rules for converting objects and rules for registering objects.

Pay attention to the following parameters:
release numbers of source-configuration and destination-configuration for which the rules are intended;
- the date when the rules were created.
- In the further description, we will call the listed parameters - controlled parameters.

The control is carried out according to the following rules:

- the value of the monitored parameters that are loaded into the source configuration is determined;
- the value of the monitored parameters that are loaded into the receiver configuration is determined;
- the value of the monitored parameters is determined, which are included in the delivery of the source configuration;
- the value of the monitored parameters is determined, which are included in the delivery of the receiver configuration.

After analyzing all these rules, those rules are selected, the creation date of which is the most relevant [10]. When analyzing the rules, you need to pay attention to the release numbers of the configurations. The configuration release numbers specified in the rules must necessarily correspond to those configuration releases between which data synchronization is configured [11].

To determine the value of the monitored parameters that are loaded in the configuration, it is necessary to perform certain actions. Create a new data exchange, but do not execute it. Open the created exchange setting. In the command panel of the form that opens, click Data exchange parameters -> Open object conversion rules. Check the information about the exchange rules.

Similarly, you can analyze the monitored parameters that are loaded into the configuration and for the already existing exchange settings. These actions should be performed sequentially for the source configuration and the destination configuration.

To determine the value of the monitored parameters that are included in the delivery of configurations, you must perform the following steps:

- in the form of exchange settings, press the button "Information about the rules file";
- select the file of conversion rules from the configuration package.

When setting up data synchronization on the "1C: ERP" side, the file should be searched for in the "Data synchronization \ <Correspondent program name>" subdirectory. When setting up data synchronization on the "1C: SPM" side - in the "Data exchanges \ <Correspondent configuration name>" subdirectory.

These actions should also be performed sequentially for both configurations that are involved in the exchange.

If the source of the rules is rules from an external file, then you need to carry out an additional check, for this:

- It is necessary to save a copy of the rules in use to a file using the Upload rules button of the conversion rules form.
- Set the Rule source switch to the Typical rules from configuration position.
- Click on the Load rules button.
- View the provided policy information.

As a result of checking the exchange rules, one of the decisions is made:

1. Continue using the current conversion and registration rules.
2. Load the saved conversion rules back into the configuration.
3. Use fresh rules from the set of correspondent configuration rules. The loading procedure is described in the file Instructions for connecting exchange rules.txt. If the relevance of the rules is checked in "1C: ERP", then the instruction file should be searched for in the subdirectory "Data exchanges \ <Name of the correspondent's program>" of the "1C: SPM " delivery file directory. If the relevance is checked in the "1C: SPM" configuration, then the instruction file should be searched for in the "Data synchronization \ <Correspondent program name>" subdirectory of the "1C: ERP" delivery file directory.

4. Use, instead of rules from an external source, standard conversion rules and rules for registering objects built into the configuration.

After creating a new data synchronization in "1C: SPM" with the option for sending documents "Manual data synchronization", you must perform the following additional steps:

1. Start service processing. Registration of changes for exchange.
2. Select the node of the exchange plan.
3. Clear registration for each of the types of documents using the "Unregister changes" command.
4. Start data synchronization.

3. Results
As a result of performing the described actions, the initial unloading will contain only the elements of regulatory and reference information used in the documents.

Let's consider the features of synchronization of salary reflection documents. For these purposes, 1C: ERP uses the document Reflection of salaries in financial accounting [12], and in "1C: SPM" - Reflection of salaries in regulated accounting.

Detailing of information in the document Reflection of salaries in financial accounting uploaded to 1C: ERP depends on the Send accruals and deductions with detail by individuals checkbox, which is located in the data synchronization setting on the "1C: SPM" side. If this flag is not selected, accruals and deductions in the document Reflection of salaries in financial accounting will be loaded in summary, without detailing by individuals.

If the checkbox Send accruals and deductions with details by individuals is selected, the data in 1C: ERP is also received in the context of individuals (data on individuals are loaded in the tabular section Accrued wages and contributions of individuals, which is stored in the document, but is not displayed on form of the document).

The document Reflection of salaries in regulated accounting does not contain data on contributions to funds in the context of individuals. This information is taken in "1C: SPM " from the accounting data.

The lines of the document Reflection of salaries in the regulated accounting in "1C: SPM " are indicated in the context of the types of charges. In "1C: ERP" document lines are indicated in the context of the types of operations [13]. The figure below shows the algorithm for converting the types of charges from "1C: SPM " to the types of operations in the UP. The type of operation in "1C: ERP" is determined depending on the combination of the following fields of the type of accrual: Is income in kind, Type of social insurance benefit, Type of income of insurance premiums, Method of calculation. Data transfer is carried out in all types of payroll operations in "1C: ERP" except: Payments to former employees, Income of counterparties, other settlements with personnel.

Data on personal income tax is taken from the tabular section of the Transaction, movements on credit 68.01, debit 70. The department is determined from the employee's personnel information.

As far as fees are concerned, the structure of data storage differs. In "1C: SPM " for each value of contributions to funds there is a separate line in the tabular section of the Transaction.

In "1C: ERP" - separate columns of the hidden tabular section Accrued wages and contributions by individuals.
At the same time, postings for reflecting paid contributions in "1C: SPM" may be without analytics of divisions. In this case, such transactions will be transferred to "1C: ERP" in the "Default department". It is necessary to correct this subdivision to the correct value in manual mode.

When transferring data to "1C: ERP" in the document Reflection of salaries in financial accounting, the amounts of insurance premiums are reflected not in separate lines, as in "1C: SPM", but in the lines of accruals. In this case, insurance premiums are distributed between the lines with the types of operations Accrued, Accrued piece-by-work, Contract (works, services) in proportion to the amounts of charges on these lines.

If in "1C: SPM" for the type of accrual it is indicated that income is not subject to insurance premiums, the distribution of insurance premiums to lines with such accruals is not made.

Withholdings of wages are reflected in "1C: SPM" in the document Reflection of wages in regulated accounting in the tabular section of Transactions. Posting on Dt 70, on the loan there can be accounts 76.41, 68.01 and others [14].

In "1C: ERP" deductions are reflected in the document Reflection of salaries in financial accounting in the tabular section of Retentions. Deductions from "1C: SPM" are transferred to one of several types of transactions in accordance with the rules in the table 1 below.

| Table 1. Transfer rules for transaction types. |
|-----------------------------------------------|
| **Criterion ("1C: SPM")** | **Holding operation type ("1C: ERP")** | **Accounting account retention** |
| In the form of deduction calculation, the attribute "Is additional insurance contributions to the funded part of the pension" is set | Voluntary contributions to the funded part of the pension | 69.05.2 |
| Accounting account Kt of the method of reflecting wages = 71.01 | Withholding unspent accountable amounts | 71.01 |
| Accounting account Kt of the way wages are reflected = 73.01 | Repayment of loans | 73.01 |
| Accounting account Kt of the way wages are reflected = 73.02 | Compensation for damage | 73.02 |
| Accounting account Kt of the way wages are reflected = 73.03 | Deduction for other transactions with employees | 73.03 |
| Accounting account Kt of the way wages are reflected = 76.41 or The calculation method is one of: | | |
| - A writ of execution in living wages | Alimony and other orders of execution | 76.41 |
| - Executive order percentage | | |
| - The writ of execution interest up to the limit | | |
| - A writ of execution in a fixed amount up to the limit | | |
| None of the listed criteria | Other deductions | 76.49 |

4. Discussion

Dmitry Zhichkin, in his report at the Infostart Event Community conference, describes in detail the physical structure of exchange plans and mechanisms for registering changes, considers the main problems (blocking, maintaining integrity, replicating transactions) that arise when uploading changes and proposes methods for solving them.

He notes that there are a number of features to consider when converting data and using exchange plans. The original ideology of conversion did not imply the transfer of objects that were removed from the infobase.
Accordingly, all algorithms for uploading and downloading data are designed in such a way that such elements are not unloaded. This applies to deleted elements (not marked for deletion, namely deleted) directories and documents (or other reference data types), deleted register records. Due to the systemic peculiarities of the implementation of exchange plans, it is not recommended to abuse the upload of changes according to exchange plans. The fact is that when reading changes, all change tables are locked. Those. when unloading, the exchange plan does not allow recording new changes, and, therefore, blocks the elements themselves - directories, documents, etc.

It is recommended to unload during non-working hours or in very small batches of data so that the locks are for the shortest possible time.

Saifudinov V A offers a set of the following guidelines for configuring and unloading modified objects:
1. It is recommended to use a separate exchange plan for exchange with each separate configuration. It is best to do this, first of all, for speed of work. The exchange plan should contain only those metadata for which conversion rules are configured. The more unnecessary objects in the exchange plan for which conversion rules are not configured, the slower the system will work.
2. For the exchange of each separate infobase, a separate exchange node should be used.
3. It is not recommended to use several exchange nodes in one unloading.
4. It is necessary to carefully approach the setting of the Change registration parameter for exchange nodes after unloading - remote registration of changed objects cannot be restored.

1C uses the method of registering changes without data. A feature of the implementation of this technique by 1C is the presence of only one change registration record for each object. This is what causes data exchange blocking conflicts.

To solve the problems associated with the use of 1C exchange plans, an alternative implementation by means of the platform is proposed [15].

5. Conclusion
"1C ERP" is a more complex system for automating the activities of enterprises. However, the decision to use a separate, narrowly focused product "1C SPM" is justified in some cases, however, it generates a number of problems associated with the exchange and synchronization of information between the head center using "1C: ERP" and structural divisions of the company. To solve this problem, 1C developers provide universal internal mechanisms for the exchange and synchronization of data, which were discussed in this article. The provided funds can be used both together and separately, in various combinations. Based on these mechanisms, the process of data exchange between "1C: ERP" and "1C: SPM" was implemented.

Thus, 1C provides high-quality and efficient systems for the automation of business activities of enterprises. In addition, it allows internal means to organize the exchange and synchronization of information between various products of the company.

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