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INTEGRATION OF SOFTWARE COMPONENTS OF DISTRIBUTED INFORMATION SYSTEM

Actual problem, dealing with the integration of software components of distributed information system is considered. Main facilities of integration have been analyzed. The scheme of realization of integration of information distributed system elements for the problems of regulated information exchange is proposed.

Key words: *integration, distributed information system, information processing.*

Introduction

Rapid development of information technologies in recent years has opened wide possibilities for development of efficient information systems for application in various branches. At the same time, processes automation in large companies and construction of unified information system is connected with certain difficulties [1]. Especially this concerns situations, when within the framework of one company, several autonomous automated systems exist, performing specific tasks [2]. These systems may have their own databases, for storage of information, server of applications, interfaces with other systems (Fig. 1).

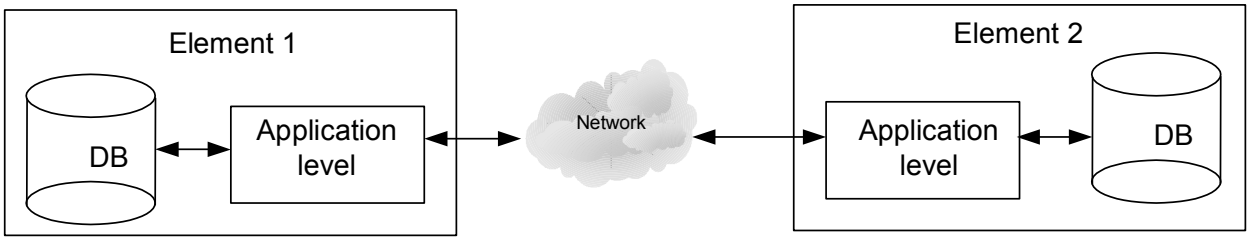

Fig. 1. Architecture of distributed system

Systems, operating in the sphere of telecommunications, enterprises management, banking sphere, etc can be referred to the systems of the given class. For instance, operators of telecommunication services must provide integration of bilingual system with the system of mass printing of accounts system of payments reception, etc.

Since the majority of such systems were designed and realized separately, there emerges the **problem** of their adaptation and integration. This is connected with different architecture of the systems, different technologies of realization, usage of different protocols of data exchange and other specific features [3].

To solve the above - mentioned problem two approaches are mainly used: development of new computer-based system and integration of the existing systems (“stripe automation”).

The first variant requires, as a rule, considerable capital investments and time, that is why, it is used in case, when integration of the existing system is not possible or is not expedient. For the realization of the second variant system integrators – specialized companies, developing method and facilities of integration of business –processes processes of the enterprise, are used [4, 5].

The efficiency of such approach greatly depends on the choice of integration facilities. In spite of existing recommendations regarding systems design and experience of integration, nowadays there are no available techniques of complex systems elements integration.

That is why, there appears actual **task** to provide integration of software components of distributive system.

To solve this problem it is necessary:

substantiate integration facilities;
develop the algorithm of integration;
evaluate the quality of integration;

The given paper considers the class of problems where interaction between systems is carried out in accordance with certain rules (**problems of regulated information exchange**, or RIE). The examples of such problems is the problem of obtaining of currency exchange rates, problems of application transfer from the subsystem of applications reception into subsystem of their realization, etc.

Substantiation of integration facilities

For integration of automated systems, facilities, operating with multipurpose formats of data description and their transfer got wide application .

XML – standard of construction of languages for making hierarchically structured data is referred to multipurpose tools of data description. This standard is developed under the auspice of W3C consortium and is supported by the majority of companies - software developers -Microsoft, Sun (Oracle), IBM та ін.

Among the protocols of transporting level one of the most universal is http, supported by all major operation systems and developers. As program realization of selected data formats and transport, web-service, providing the set of methods called by means of SOAP-protocol via HTTP is suggested.

Model of RIE subsystems interaction is shown in Fig. 2.

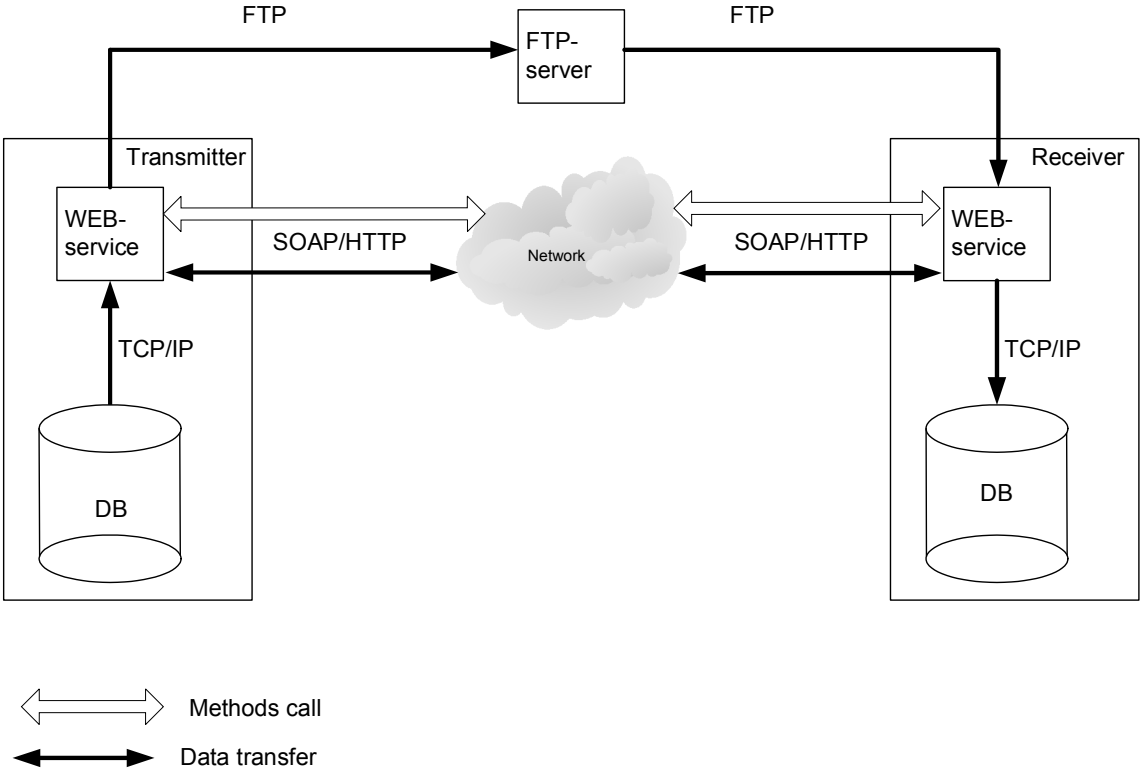

Fig. 2 Model of interaction of distributed system elements

The suggested model provides the call of WEB-service method by SOAP –protocol and data transfer by SOAP – protocol, http or ftp.

Algorithm of interaction of distributed system software components

In the process of RIE problems execution three elements participate: subsystem-transmitter, subsystem-receiver and subsystem-coordinate.

Algorithm of interaction of program component of distributed information system for RIE problems consists of the following steps:

Matching of parameters of data transmission: data format determination, possibility of archiving and coding, selection of transfer protocol.

Conversion of data into required format by subsystem-transmitter.

Data transfer.

Reception of the data by the subsystem – receiver and their pressing.

Confirmation of successful data processing.

Establishment of parameters of the next information exchange.

UML – diagram of the sequence of system elements interaction is shown in Fig. 3.

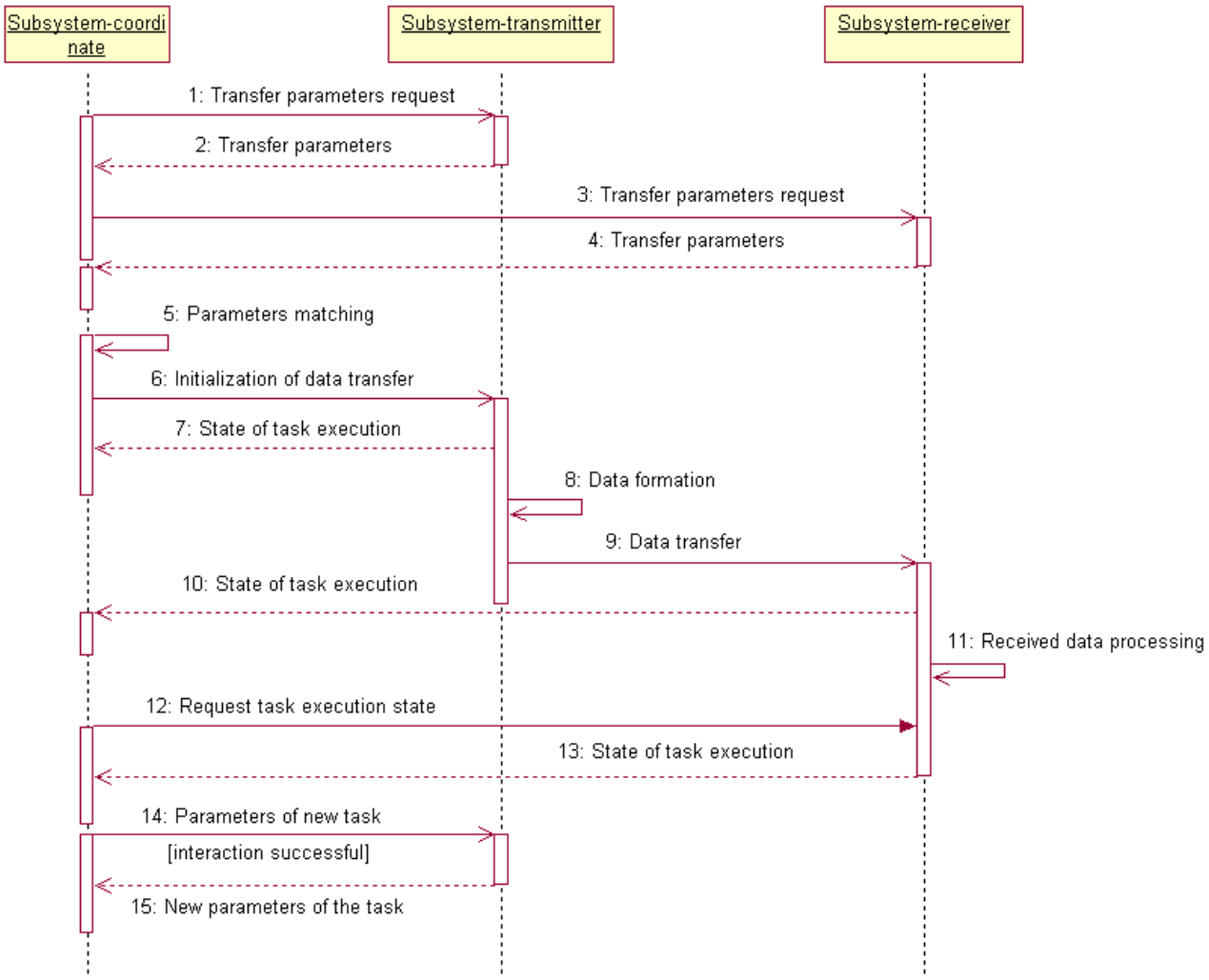

Fig. 3. UML-diagram of interaction sequence of distributive system elements

It should be noted, that as coordinator subsystem, the existing systems of business-processor coordination, for instance, Microsoft BizTalk Server can be used.

Evaluation of integration quality

The criterion of the efficiency evaluation of the distributed system elements interaction is the time of RIE problem T, defined by the formula

$$T = \tau_{form} + \tau_{conv1} + \tau_{trans} + \tau_{conv2} + \tau_{us},$$

where τ_{form} – is the time of necessary information formation; τ_{conv1} – is the time of information conversion in the required form by system- transmitter; τ_{trans} – is the time of data transmission; τ_{conv2} – is the time of data conversion by system-receiver; τ_{us} – is the time, needed for information usage.

Limitations of the given criterion are maximum admissible characteristics of hardware facilities, used while interaction.

Minimization of time T while usage of limited resources is one of the main problems of integration.

Analysis of subsystems interaction configurations

For organization of the interaction between subsystems, configurations, given in Table. 1 are suggested.

Table 1

Configurations of information exchange

Number of configuration	Type of data transmission transport	Data format	Information Compression
1	http	text	yes
2	soap	xml	yes
3	ftp	text	yes
4	http	text	no
5	soap	xml	no
6	ftp	text	no

According to the model of elements interaction (Fig. 2) and Table 1 interaction occurs by means of SOAP protocol via which the call of web-service methods is realized. In this case the data can be transmitted by the following methods:

directly into SOAP-message while web-service call;

by means of http-protocol. In the given case in the body of SOAP message, url-address, where data are available, is indicated;

by means of ftp-protocol. In the body of SOAP-message ftp-address of the data file is indicated, as well as parameter of the access to it (login, password, etc).

The suggested integration algorithm is used for the solution of the problem of regulated information exchange between bilingual system “ACTRA” (developed by IPE «InnoVinn») and automated system “Mediation System”, used by joint-stock company “Ukrtelecom”. The results of experimental research of the suggested configurations are given in Table 2. Time (sec.), needed for the exchange of corresponding volume of data at preset configuration is indicated in cells.

Table 2

Interaction time for various configurations

Configuration	Volume, Mbytes							
	10	30	50	70	90	110	130	150
1	8	12	18	17	20	43	50	65
2	9	10	16	15	19	35	41	61
3	8	13	17	17	19	45	51	70
4	5	7	10	14	21	31	43	59
5	4	6	9	13	18	26	36	48
6	5	8	11	14	20	32	43	55

The results show that for the considered problem of information exchange the best configuration is configuration № 5.

Conclusions

Integration facilities for software components of information system intended for the problems of regulated information exchange are suggested. Integration model and interaction algorithm, enabling to provide interaction between software components according to necessary rule are developed. Time of interaction for one of RIE problems, on the base of which optimum configuration at preset data volume can be selected, is obtained.

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