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**To the question of problems of development of an automated system for warning and forecasting breakthroughs of dams**

**Summary.** This article describes hydrotechnical structures that are hazardous to human life and health, as well as the monitoring of water levels in seas and rivers.In addition, it is a basic method to create an automated system for solving problems.The overall objective of the article is to draw attention to the massive material damage and to the problems that arise from natural disasters and emergencies that may result in human life.The article also discusses the methods of water level monitoring in the reservoirs.

**Key words:** forecasting the effects of floods, disaster, GIS-technologies.

Жомартова Ш.А., Зиятбекова Г.З.

**Бөгеттердің бұзылуын алдын-алу және болжау үшін автоматтандырылған жүйені әзірлеу мәселесінің сұрақтары**

**Резюме.** Бұл мақалада адам өмірі мен денсаулығына қауіпті болып табылатын гидротехникалық құрылымдар, сондай-ақ, теңіздер мен өзен-көлдердегі су деңгейінің мониторингін жүргізуге сипаттама берілген. Сонымен қатар, ол мәселелерді шешу үшін автоматтандырылған жүйе құру негізгі әдіс болып табылады. Мақаланың жалпы мақсаты –ауқымды материалдық шығынның және адам өміріне нұқсан келтіретін дүлей апаттар мен төтенше жағдайлардың салдарынан туындайтын мәселелергеге адамзат назарын аудару болып табылады. Сондай-ақ, мақалада су қоймаларындағы су деңгейінің мониторингін жүргізу әдістері жайында айтылады.

**Түйінді сөздер:** су тасқынының зардаптарын болжау, табиғи апат, ГАЖ-технологиялар.

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**DISTRIBUTED DATABASE FOR CORPORATE INFORMATION CONTROL SYSTEM OVER ENTERPRISES NETWORK**

**Abstract.** The article herein considers the task of building the corporate information system for the network of big geographically-distributed enterprises of retail sales, as well has studied the design of distributed database and its operation parameters computation. Currently there are active processes of small enterprises integration into corporations. Corporation information systems, as a rule, shall secure the work of several geographically-distributed

subdivisions. In that respect it becomes impossible to use database centralized architecture. Information resources shall be distributed. Proceeding from the executed work there were formulated the criteria allowing selection of base software products, meeting the requirements of the future corporate information system (CIS). For the present time there have been recommended DBMS Progress (v 9.1B), OS Windows XP for a front end, OS Windows 2000 Server for a back end and network protocol TCP/IP.

There has been elaborated a general model of corporate information system distributed database structure; class ERP for controlling over branches network and methods of its operation optimal characteristics computation.

**Key words:** distributed database, business process, corporate information system, database managing system (DBMS), data models, replicating.

**Introduction.** Timeliness is conditioned with the fact that at present the network technologies make up the base of corporate information systems of contemporary enterprises, the business of which demands continuous, reliable communication facilities operation and data processing [1]. An important task is securing the network technologies reliability. Upon fails and rejects in hardware and software facilities of corporate information system all system users' normal operation is disordered, also such malfunctions in data storage information processes, such as data loss or data distortion are very dangerous. The mentioned disorders in the system operation bring to enterprise's big losses [2]. Therefore it is necessary to draw the most careful attention to information processes, occurring in the system, trace its reliability and correctness of the information processing results being obtained [3].

The research of the system thereof is made in scientific works of foreign scientists Dyllick T., Hockerts K., Hahn R., Cohanier B., Biberstein N., Earle T., Kumar B.V., Mabruk M.I., Josuttis N.M., Robinson R., Д. Westerman D., Russian scientists, involved into corporate database research are Grekula V.I., Samarina A.V., Popova S.B., etc. In the field herein we can distinguish the works of such Kazakhstan scientists as Kuandykov A.A., Niyazov R.S., Naizabayev L., etc.

Corporate information system, as a rule, shall secure the work of several geographically-distributed subdivisions. In that respect it becomes impossible to use database centralized architecture. Information resources shall become distributed. Distributed database is a complex of logically interconnected database, distributed in the computer network.

Nowadays from the sphere of retail sale there is practically disappeared the phenomenon of «surplus profit», which have had place at the dawn of market relations establishment. Under competitive circumstances the revenue generation is possible, mainly, through retail margins abatement and sales turnover increase [4]. But not merely the low prices attract a buyer. Sales volume is influenced by a number of factors. As an example we can exemplify an assortment structure. A shop should present the commodities a buyer is interested in. And the task is much more complicated than simple revelation of the most saleable goods names, as availability of certain goods can make an impact on other commodities turnover [5,6].

Taking into account insufficient means, allocated for marketing and management there is needed a qualitative transition. Management performance upgrading means using the information system.

Corporate information system architecture for enterprises network control. Integrated system of trading enterprises network automation system is a complicated set of hardware and software [7]. System's performance, reliability and functional potentials to a large extent depend on the corporate information system's efficiency.

Concept-based statements having become the basis for corporate information systems designing have been solved by the tasks, facing a shop, being a structural unit of commodity-money circulation area [8,9].

The offered structure can operate solely at overall automation of every shop and at smooth-running operative information exchange [10]. That is, there is required a corporate information system able to solve the set problems.

As far as hardware structure is concerned, it is designed, first and foremost, to secure the trading process operation. In other words, it is indispensable to organize efficient front-office devices functioning, i.e.: checkout counters, electronic weighting units and labels printers [11,12]. Hardware structure might be considered efficient, if it makes possible an operative data exchange and continuous front-office facilities operation. In that respect there is introduced a dedicated server to manage counters, weighting units and printers [13].

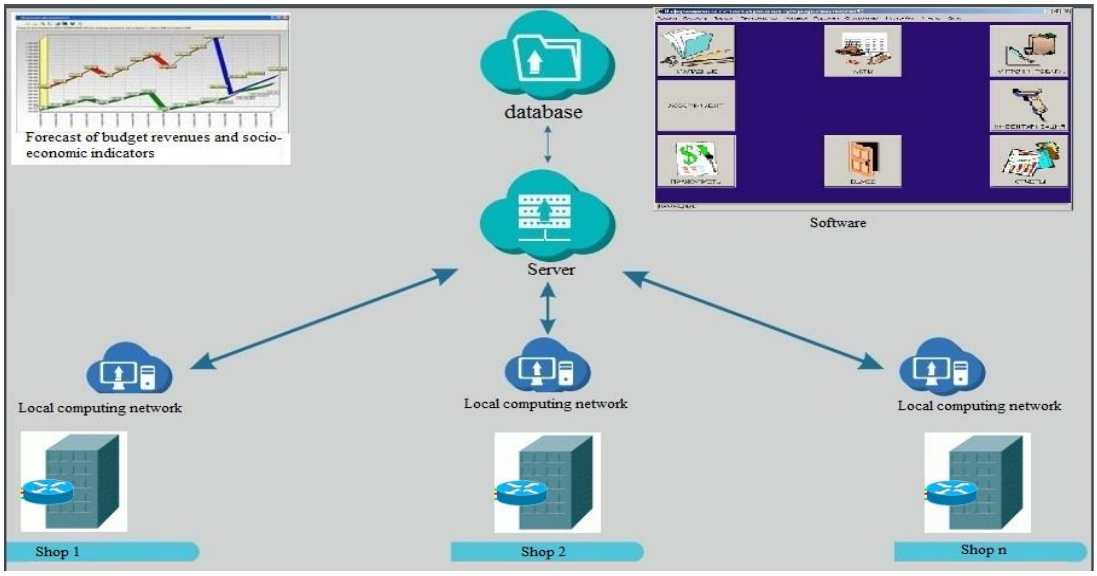


**Figure 1.** Information system's overall architecture

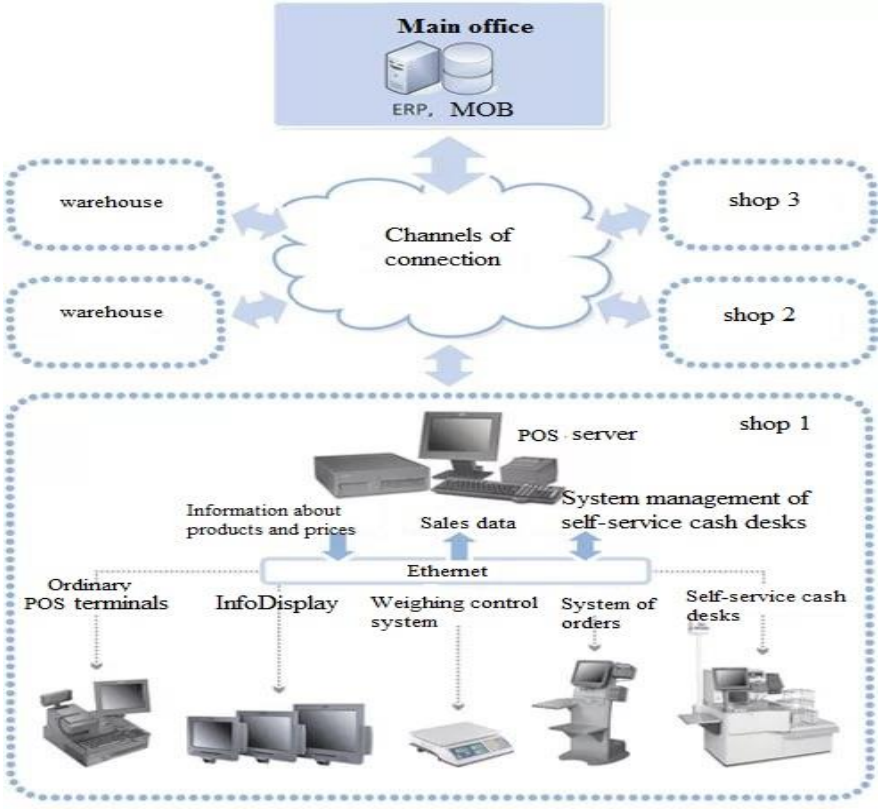


**Figure 2.** Structure of the main hardware

**Structure of distributed database for corporate information system of control over the branches network**

Herein we consider an enterprise, consisting of one-type branches network N and one control center. Distributed database, in this situation, represents the complex of logically interconnected database control center and N similar branches' database. As data changing transactions, as a rule, do not go beyond the local network, their optimization method is the distributing the computation for local database. Let's focus the main attention at optimizing the requests to database [14].

Upon the conditions of direct links unavailability between the branches. All requests to the distributed database might be classified as follows:

1. Requests to a branch data within the branch local network
2. Requests to a branch data from the center
3. Requests to a center data from the branch
4. Requests to a center data within the center local network.

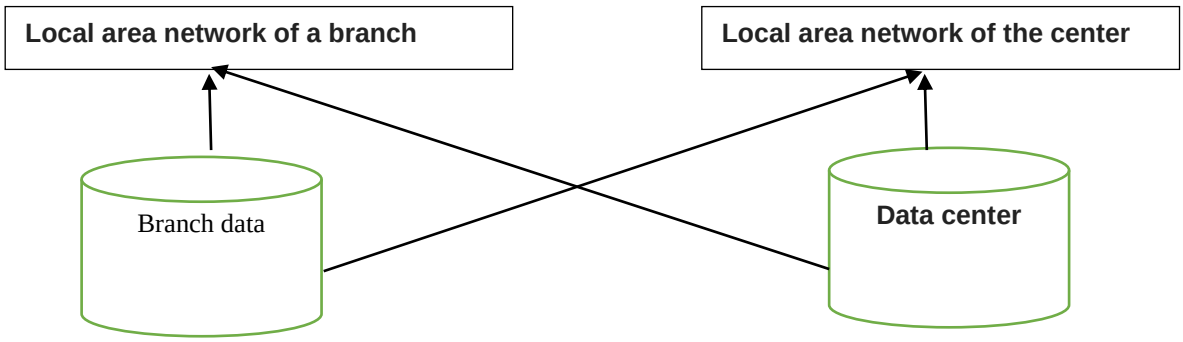


**Figure 3.** Request types

As well all requests can be broken down additionally into one-time (data is transferred simultaneously) and manyfold (one and the same data is transferred repeatedly). It should be noted that the most expensive are remote requests, i.e., requests between a branch and center. Particularly, the requests thereof shall be drastically optimized. First of all, it is reasonable to use distributed computing upon transmitting only final data, and total front-end processing is fulfilled within the remote database server. Naturally, in that case there is being increased the load on the database server, but it is in most cases paid off at the expense of considerable acceleration of requests fulfillment and traffic decrease [15]. To increase the speed of manyfold requests processing there applied data storage techniques, which execute data aggregation. Aggregation demands additional computing resources and memory volume on hard disks [16]. Aggregation process can be executed asynchronously, when processing is performed after initial data changing. It allows distributing computing resources at a time more evenly, but hereby there occur the problems of data consistency and truth. Replicating is frequently applied for repeated remote requests optimization, also in cases of particular requirements to single-shot requests execution speed. Upon replicating there again occur the tasks of the data consistency and truth [17,18].

Operation of distributed database of branches network control

There are *N* similar local database branches and one control center's local database. Let's consider the case, when branches do not interrelate, center and branches are connected by means of ADSL. Replicating the center's reference table to the branches actually is the global control transmitting. Apart from the global control there is fulfilled the local self-control over a branch.

Let us introduce indications:

Branch local network fulfills transmitting express requests results and requests outcomes through applications server.

$T^F$ – aggregation period of the branch operative database

$T^c$ – replicating period of the branch storage

$K^F_{agr}$ – aggregation factor of the branch database

$V^F$ – flow rate of the branch database initial data

$V^n$ – flow rate of the branch users database requests

$q^n$ users requests number

$N$ – branches number

$V^c$ – center's reference table volume

$T_{con}^{F}$ – local control period

$T_{con}^{c}$ – replicating period from the center

$V_{lcon}^{F}$ – data volume being processed for local control computing

$V_{con}^{F}$ – data correcting volume after local control computing

$S_{db}^{F}$ – processing time of the branch's DBMS data unit

$s^{n}$ – processing time of the user's operating station CP data unit

$z$ – computing distribution parameter

$K_{sa}^{F}$ – relative data reduction upon fulfilling the request through applications server.

Branch's DBMS fulfills initial data recording, aggregation data recording into the storage, replicating data recording from the center, local control recording, reading the data requested by the users, reading data for aggregation, reading data for replicating to the center and reading the data for local control. At that, one recording operation corresponds to $K_{db}^{F}$ reading operations.

$$K_{db}^{F}\left(V^{F}+V^{F}*K_{agr}^{F}+\frac{V^{c}}{T_{con}^{c}+T^{c}+T^{F}}+\frac{V_{con}^{F}}{T_{con}^{F}+T^{F}}\right)+V^{n}+V^{F}+\frac{V^{F}*K_{agr}^{F}}{T^{c}+T^{F}}+\frac{V_{lcon}^{F}}{T_{con}^{F}+T^{F}}<\frac{1}{S_{db}^{F}} \quad (1)$$

Branch's local network fulfills express requests results transmitting and transmitting the requests results through applications server.

$$z*V^{n}+(1-z)*K_{sa}^{F}*V^{n}<\frac{1}{S_{network}^{F}} \quad (2)$$

Global network fulfills transmitting replicating data from a branch to the center and from the center to a branch. At that an incoming. In this case, the incoming speed in kADSL is greater than the outgoing.

$$N*K^{ADSL}*\frac{V^{c}}{T_{con}^{c}+T^{c}+T^{F}}+N*\frac{V^{F}*K_{agr}^{F}}{T^{c}+T^{F}}<\frac{1}{S_{network}^{ADSL}} \quad (3)$$

$$K^{ADSL}*\frac{V^{F}*K_{agr}^{F}}{T^{c}+T^{F}}+\frac{V^{c}}{T_{con}^{c}+T^{c}+T^{F}}<\frac{1}{S_{network}^{ADSL}} \quad (4)$$

User's operating station CP executes express requests data processing.

$$z*V^{n}<\frac{1}{s^{n}} \quad (5)$$

Branch server CP apart from serving DBMS operation fulfills aggregation computing, local control and requests data processing computing through applications server.

$$g_{db}^{F}*\left(K_{db}^{F}*\left(V^{F}+V^{F}*K_{agr}^{F}+\frac{V^{c}}{T_{con}^{c}+T^{c}+T^{F}}+\frac{V_{con}^{F}}{T_{con}^{F}+T^{F}}\right)+V^{n}+V^{F}+\frac{V^{F}*K_{agr}^{F}}{T^{c}+T^{F}}+\frac{V_{lcon}^{F}}{T_{con}^{F}+}T^{F}\right)_{+}$$

$$g_{agr}^{F}*V^{F}+\frac{G_{agr}^{F*}}{T^{F}}+\frac{G_{con}^{F}}{T_{con}^{F}+T^{F}}+G_{sa}^{F}*(1-z)*V^{n}<\frac{1}{S_{pro}^{F}} \quad (6)$$

Average time of users' requests processing:

$$t^n_{average} = \frac{T}{q^n} * \left[ S^F_{db} * \right.$$
$$* \left( K^F_{db} * \left( V^F + V^F * K^F_{agr} + \frac{V^c}{T^c_{con} + T^c + T^F} + \frac{V^F_{con}}{T^F_{con} + T^F} \right) + V^n + V^F + \frac{V^F * K^F_{agr}}{T^c + T^F} \right.$$
$$\left. + \frac{V^F_{lcon}}{T^F_{con} + T^F} \right) + S^n * z * V^n + S^F_{agr} * V^F + \frac{S^F_{agr^*}}{T^F} + \frac{S^F_{con}}{T^F_{con} + T^F} + S^F_{sa} * (1 - z) * V^n$$
$$\left. + S^F_{network} * (z * V^n + (1 - z) * K^F_{sa} * V^n) \right] \quad (7)$$

Penalty for exceeding the global network traffic:

$$C^{ADSL} = \begin{cases} 0, V^{ADSL} * T < V^{ADSL}_{sub}, \\ C^{ADSL} * (V^{ADSL} * T - V^{ADSL}_{sub}) \end{cases} where V^{ADSL} = N * \left( \frac{V^c}{T^F_{con} + T^c + T^F} + \frac{V^F * K^F_{agr}}{T^c + T^F} \right) \quad (8)$$

Penalty for local control delay:

$$C^F_{con} = \begin{cases} 0, \ T^F_{con} + T^F < T^F_{con} \\ C^F_{con} * T * \left( 1 - \frac{T^F_{con}}{T^F_{con} + T^F} \right) \end{cases} \quad (9)$$

Penalty for global control delay:

$$C^F_{con} = \begin{cases} 0, \ T^F_{con} + T^c + T^F < T^c_{con} \\ C^n_{con} * T * \left( 1 - \frac{T^c_{con}}{T^c_{con} + T^c + T^F} \right) \end{cases} \quad (10)$$

Penalty for users' requests processing delay:

$$C^n_{average} = \begin{cases} 0, \ t^n_{average} < T^n_{average} \\ c^n_{average} * \left( t^n_{average} - T^n_{average} \right) \end{cases} \quad (11)$$

Operation parameters $(T^F, T^c, T^F_{con}, T^c_{con}, z)$ shall be selected so as to reach penalty minimum sum.

$$S^{ADSL} + C^F_{con} + C^c_{con} + C^n_{average} \xrightarrow{(T^F, T^c, T^F_{con}, T^c_{con}, z)} min \quad (12)$$
$$1 < T^F < T$$
$$1 < T^c_{con} + T^F < T$$
$$1 < T^c + 1 < T^F < T$$
$$1 < T^c_{con} + T^c + T^F < T$$
$$0 < z < 1$$

Based on the offered algorithms there was fulfilled distributed database operation parameters computing to minimize operating cost based on the following initial data.

DBMS: Enterprise Progress 9.1B28

Server: Intel 2 x Pentium III 800 RAM 512 RAID 5 OS Windows 2000 Server.

Client: Celeron 700 RAM 64 OS Windows 98

$T = 43200$ minutes (period)

$V^F =$1560 (branch database initial data flow rate)

$V^n =$30000 (flow rate of the branch's users data requests)

$q^n$ =50000 (users requests amount)
$N$ =3 (number of branches)
$V^c$ =5000 (center's reference table volume)
$V_{lcon}^F$ =25000 (data volume being processed for local control computing)
$V_{con}^F$ =4000 (data correcting volume after local control computing)
$K_{agr}^F$ =0.05 (aggregation factor of the branch database)
$K_{sa}^F$ =0.1 (relative data volume reduction upon fulfilling the request through applications server)
$K_{db}^F$ =30 (ratio of recording speed to the reading speed of database)
$K^{ADSL}$ =5 (ratio of ADSL data receive and communication speed)
$S_{network}^{ADSL}$ =1.53e-6 (ADSL data communication time)
$S_{network}^F$ =2.38e-8 (branch area communication time)
$S_{db}^F$ =1.05e-5 (branch DBMS recording processing time)
$S^n$ =1.66e-5 (user working station CP recording processing time)
$S_{agr}^F$ =4.16e-6 (recording aggregation time)
$S_{sa}^F$ =2.00e-6 (time of recording preprocessing time on database server)
$S_{agr^*}^F$ =0.007 (time of aggregated data block recording)
$S_{con}^F$ =0.05 (time of local control block recording)
$V_{sub}^{ADSL}$ =2.10e+6 (prepaid network traffic)
$C^{ADSL}$ =1.72e-5 (payment for exceeding traffic network)
$T_{con}^F$ =60 (tolerable delay of local control)
$C_{con}^F$ =0.29 (payment for local control delay)
$T_{con}^c$ =1440 (tolerable delay of central control)
$C_{con}^c$ =0.13 (payment for central control delay)
$T_{con}^n$ =1 (tolerable time for user's request processing)
$C_{average}^n$ =1000 (payment for user's request processing delay)

$T^F$ =60
$T^c$ =300
$T_{con}^c$ =0
$T_{con}^F$ =0
$z$ =0
$C^{ADSL} + C_{con}^F + C_{con}^c + C_{average}^n$ =0

Thus, operation will be performed according to the next plan:

Every 60 minute (1 hour) there is fulfilled branch's data aggregation. With periodicity 360 minutes (6 hours) branches' aggregated data is replicated to the control center. With periodicity 360 minutes (6 hours) the global control is replicated from the control center to the branches. Local control is fulfilled with periodicity of 60 minutes (1 hour). Overall users' requests processing is executed on the database server.

## Conclusion

Active developing the information technologies sets up prerequisites for creating and applying corporate information systems. Despite a large number of systems presented at the Russian market, the enterprises' management has to take decisions on elaboration of similar systems in retail trade area. In particular, it has the big practical importance.

In the result of the fulfilled work there have been formulated the criteria allowing to choose the base software meeting the requirements of the future corporate information system. Currently there were recommended DBMS Progress (v 9.1B), OC Windows XP for front end, OC Windows 2000 Server for a server and network protocol TCP/IP.

There has been developed the common model of distributed database for corporate information system of class ERP for control over branches' network and its operation's optimal characteristics computing methods.

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Найзабаева Л.Қ., Оразбеков Ж.Н., Нұржанов Ш., Сатымбеков М.Н. Туркен. Г.

**Кәсіпорынның таратылған деректер қоры желілерін басқару үшін корпоративтік ақпараттық жүйе құру**

**Түйіндеме.** Бұл мақалада ірі аумақтық сауда бөлшек желілері үшін, таратылған корпоративтік ақпараттық жүйесін құру мәселесі, сондай-ақ бөлінген деректер базасын жобалау және оның жұмыс істеу параметрлерін есептеу қаралды. Қазіргі кезде шағын кәсіпорындардың корпорацияларға интеграциялау үрдісі қарқынды дамуда. Корпорацияның ақпараттық жүйесі, әдетте, бірнеше аумақтық бөлінген бірліктердің жұмысын қамтамасыз етуі тиіс. Осыған байланысты орталықтандырылған деректер базасының сәулетін пайдалану мүмкін емес. Ақпараттық ресурстар үлестрмелі болу керек. Жүргізілген жұмыс нәтижесінде қалыптасқан критерийлер болашақ ТМД талаптарына сәйкес келетін негізгі бағдарламалық өнімдерді таңдауға мүмкіндік береді. Қазіргі уақытта біз СУБД Progress (v 9.1B), клиенттік бөлік үшін Windows XP, сервер үшін Windows 2000 Server және TCP / IP желілік протоколы ұсынылған.

Филиал желісін басқару және оның жұмыс істеуінің оңтайлы сипаттамаларын есептеу әдістері үшін, ERP класының бөлінген дерекқор құрылымының, корпоративтік ақпараттық жүйесінің жалпы моделі құрылды.

**Түйінді сөздер:** таратылған дерекқор, бизнес үдерісі, корпоративтік ақпараттық жүйе, дерек қорын басқару жүйесі (ДҚБЖ), деректер үлгілері, репликация.

Найзабаева Л., Оразбеков Ж.Н., Нуржанов Ш., Сатымбеков М.Н. Туркен. Г.

**Распределенная база данных для корпоративной информационной системы управления сетью предприятий**

**Резюме.** В данной статье рассматривается проблема построения корпоративной информационной системы для сети крупных территориально распределенных предприятий розничной торговли, а также рассмотрено проектирование распределенной базы данных и расчет параметров ее функционирования. В настоящее время активно протекают процессы интеграции мелких предприятий в корпорации. Информационная система корпорации, как правило, должна обеспечивать работу нескольких территориально распределенных подразделений. В связи с этим становится невозможным применение централизованной архитектуры базы данных. Информационные ресурсы должны стать распределенными. В результате выполненной работы были сформулированные критерии позволяют выбирать базовые программные продукты удовлетворяющие требованиям будущей КИС. На настоящий момент рекомендованы СУБД Progress (v 9.1B), ОС Windows XP для клиентской части, ОС Windows 2000 Server для сервера и сетевой протокол TCP/IP.

Разработана общая модель структуры распределенной базы данных корпоративной информационной системы класса ERP для управления сетью филиалов и методы расчета оптимальных характеристик ее функционирования.

**Ключевое слово:** Распределенная база данных, бизнес-процесс, корпоративная информационная система, система управления базами данных (СУБД), модели данных, репликация.

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## КОМПЕНСАЦИЯ ДИСПЕРСИИ НА ОСНОВЕ ВОЛОКОННЫХ РЕШЕТОК БРЭГГА

**Резюме.** Рассмотрены основные виды дисперсии в оптоволокне и влияние дисперсии на передачу сигнала, а также рассмотрены вопросы компенсация дисперсии в оптоволокне.

**Ключевые слова:** оптическое волокно, волоконно-оптические линия связи, дисперсия, межмодовая дисперсия, хроматическая дисперсия, поляризационная модовая дисперсия, компенсация дисперсии.

Волоконно-оптические телекоммуникационные линии связи уже прочно вошли в современную жизнь. Применение специальных оптических волокон (ОВ) в системах связи уже достигло существенного прогресса, обещая еще немало новых возможностей использования в оборудовании сетей связи следующего поколения.

В основе функционирования оптических волоконных сетей лежит принцип распространения световых волн по оптическим световодам на большие расстояния. При этом электрические сигналы, несущие информацию, преобразуются в световые импульсы, которые с минимальными искажениями передаются по волоконно-оптическим линиям связи (ВОЛС). Большое распространение подобные системы получили благодаря целому ряду достоинств, которые есть у ВОЛС по сравнению с системами передачи, использующими медные кабели или радиоэфир в качестве среды передачи. Такая полоса дает возможность передавать потоки информации в несколько терабит в секунду. Важными преимуществами ВОЛС являются такие факторы, как малое затухание сигналов, позволяющее, при использовании современных технологий, строить участки оптических систем в сто и более километров без ретрансляции, высокая помехозащищенность, связанная с малой восприимчивостью оптического волокна к электромагнитным помехам, и многие другие.

Оптические волокна – один из основных компонентов ВОЛС. Они представляют собой комбинацию материалов, имеющих различные оптические и механические свойства. Внешняя часть волокна изготавливается обычно из пластмасс или эпоксидных композиций, сочетающих высокую механическую прочность и большой коэффициент преломления света. Этот слой обеспечивает механическую защиту световода и его устойчивость к воздействию внешних источников оптического излучения.

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