

Data structures in models of informatively-administrative architecture of coal-mining enterprises

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Summary. The article suggests a data structures informatively-administrative architectures, these structures provide the opportunity to effectively and comprehensively monitor the coal-mining enterprises with use of information technologies, store and analyze the results of the monitoring. The developed models and database allow to determine the most effective architectures and distribute them, using modern information technology.

Key words: the informatively-administrative architecture, a layer, the information model, relations, data structures, structural division.

INTRODUCTION

Data structures are symbolic mathematical models, which are used in information view original objects, their elements and properties. Such models can be called information models.

The creation of such models requires a clear formalization of the components of the real objects.

The selection of efficient data structures is an important task because it allows you to create data processing technology, which will meet the requirements of performance and resource saving.

ANALYSIS OF THE PUBLICATIONS

The problem of definition of data structures to represent informatively-administrative architectures considered in the works on economic and mathematical modeling, monitoring of enterprises, in particular, in [1-4, 7-10, 12-15, 17].

Classes of elementary transformations have been allocated in the [6]. Mathematical formalisms of the description of informatively-administrative architectures were specified in [5]. But not defined the characteristics of the data structures for the storage of the results of monitoring IAA the coal-mining enterprises.

OBJECTS AND PROBLEMS

In [5] the basis of the informatively-administrative architecture adopted layer. Layer IAA is an set of many elements, which correspond to a specific characteristic propertie, and set of links between these elements. So, informatively-administrative architecture should be viewed as a set of layers:

$$A = \langle \langle E^1, C^1 \rangle, \langle E^2, C^2 \rangle, \dots, \langle E^n, C^n \rangle \rangle \quad (1)$$

were: n is the number of layers.

Analysis IAA allowed to identify key layers: posts, divisions. Their peculiarity is due to the following factors: for positions and divisions are fixed functions which depends on implementation of the company's strategic goal – specific and generic respectively. To implement these functions posts granted certain powers, tasks, roles, is subject to restrictions, provided clear reporting and administrative, disciplinary, material, or criminal liability for improper implementation or not implementation. Divisions also have the

responsibility, but indirectly, through their leaders and official person.

That is, division and post are dominant elements IYA, so, the layer of posts and divisions units are key or dominant layers of IAA. Elements of IAA other types - of software tools, features, information technology, equipment, documentation can be considered as separate layers or as specific attributes of posts or divisions.

Rapid changes in the economic situation, the legislative base, on the basis of which the enterprise operates, stipulate the requirements to timeliness and speed up changes in management information architectures, to accuracy in forecasting the consequences of these changes [6].

Adequate, accurate predictive models can be constructed on the basis of the analysis of a large number of the recorded state of the studied enterprises, which were obtained through monitoring.

For the presentation and subsequent manipulation of the results of monitoring needs relevant, adequate toolkit that not only allow to store and analyze the results of the monitoring of the enterprises, but also eliminates contradictions, inconsistencies in the information-software view of their structure, articulates the characteristics of the informational, technological, functional, will focus both on privacy layers and their interrelations.

Data structures to display IAA and its properties, such as multi-layered, hierarchy, variability are dynamic types and structured types (record, class). The type class fully reflects the property of hierarchy IAA, fields of type record may be structures.

Define the models of elements on a layer of enterprises.

The company is an independent subject that is managing with the right of a legal entity, which produces products, goods, services, carrying out work, engaged in various economic activities [18]. The main characteristics of the coal mining enterprises - the form of ownership, type of activity, its planned annual volume of coal production, organizational and legal form.

Form of ownership were considered in the monograph [8], in accordance with applicable at the time the law «On property», however, this law was cancelled with 27.04.2007. The new Civil code of Ukraine, does not use the category of „ownership”, but contains a separate article on the right of ownership of the Ukrainian people, the right of private property, the ownership right and the right of state property [19]. Thus, in the Civil code of Ukraine implemented the model according

to which there is a single ownership with the same for all the subjects of this right content and General signs, which may be different actors (the Ukrainian people, individuals, the state of Ukraine, the territorial community).

Contrary to the norms of the Civil code of Ukraine, Commercial code of Ukraine retains the category of „ownership” with the aim of identifying the types of enterprises. Of part 1 of article 63 of the Economic code of Ukraine that in Ukraine there are such forms of ownership: private ownership; the right of state ownership; the right to communal property; the right of collective ownership; mixed form of ownership; other forms of property [20].

The Economic code of Ukraine provides such kind of enterprises, as „foreign company”, which is wholly owned by foreigners. That is, in accordance with Economic code of Ukraine, you can select the form of ownership and foreign ownership.

In terms of the organizational form of the enterprise are defined as public, collective, and private businesses of the two or more forms of ownership (mixed).

Foreign enterprise – this legal form of enterprise based in Ukraine, was created as an entity under legislation of a foreign state, the property which is fully owned by foreign citizens, legal entities or the state.

The tree definition of layer enterprises is created using data types that serves object model. Class «enterprise», the heir to the class of «legal person» shall have the definition:

```

type enterprise = class (legal person)
  form_of_ownership: FO,
  organizational_legal_form: OLF,
  kind_of_economic_activity: KEA,
  position_of_the_head_of_the_enterprise:
  PHC,
  staff: staff,
  monthly_wages_fund: MFW,
  device_management: DM,
  monthly_wages_fund_device_manage:
  MFWDM,
  end.

```

Types of data used to describe the fields in the class, have the following meanings:

form_of_ownership – for the enterprises of the coal industry, there are the following forms of ownership: state and private. This means that the form of «ownership» (form of ownership – FO) will take the value from the following set: {state, private}; organizational_legal_form – this type elements that are listed (set);

kind_of_economic_activity – the list of types of economic activity for the license, since types of activities is more, the data type can be an array, the elements when a string, or set; position_of_the_head_of_the_enterprise – type string; staff – the total number of employees, the positive integer, type word; monthly_wages_fund – the positive integer, type word; device_management – the number of administration employees, the positive integer, type word; monthly_wages_fund_device_manage – the positive integer, type word.

The investigated subject area includes the enterprises, subordinated to the Ministry of energy and coal industry of Ukraine. For a database that contains enterprises of different departmental subordination, the class of «enterprise» must be contain the field «departmental subordination».

Depending of kind of economic activity a specific set of indicators describe the enterprise. For an objective assessment of the functioning of the coal enterprises used the planned and actual indices.

For example, the main characteristics of the coal-mining enterprises are the following:

- 1) planned annual coal output / actual annual volume of a coal mining,
- 2) planned daily coal output/ actual daily production of coal,
- 3) the planned number of employees/ the actual number of employees,
- 4) average dynamic take out capacity of the coal layer,
- 5) the number of sites on extraction,
- 6) the average effective number of stopes,
- 7) categories of mine on gas and on dust,
- 8) the angle of incidence of the developed layers,
- 9) the depth of reservoir development,
- 10) the number of fixed water pumping plants,
- 11) group payment.

The actual value of performance to take by necessary: for the previous period (day, year), or the average of several periods (for example, the average for the previous five years).

Class «a coal mining enterprise» is the successor of a class «enterprise», the following definition will be:

```
type coal_mining_enterprise= class
(enterprise),
planned_annual_volume_ofa_coal_mining:P
AVCM,
actual_annual_volume_ofa_coal_mining:
AAVCM,
```

```
planned_daily_production_of_coal:
PDVCM,
actual_daily_production_of_coal:FDVCM,
the_planned_number_of_employees: PNE,
the_actual_number_of_employees: ANE,
average_dynamic_takeout_capacity_of_the_
coal_layer: ADTCL,
the_number_of_sites_on_extraction: NSE,
the_average_effective_number_of_stopess:
AENS,
categories_of_mine_on_gas: CMG,
categories_of_mine_on_dust: CMD,
the_angle_of_incidence_of_the_developed_1
ayers: AIDL,
the_depth_of_reservoir_development: DRD,
the_number_of_fixed_water_pumping_plant
s: NFWPP,
group_payment: GP,
end.
```

Here PAVCM, AAVCM, PDVCM, ADVCM, PNE, ANE, NSE, AENS, NFWPP, GP – integer, positive types; CMG, CMD – gain value from the sets, defined list of items (set), AIDL – under the band the type of data or interval, DRD – consists of two parts: the name of the reservoir, for example, N8 and its depth, for example, 1080 m, such information to type record.

According to the Civil code of Ukraine «entity is an organization established and registered in accordance with the law» (article 80). For all legal entities is mandatory presence of constituent documents (the Charter or articles of incorporation (article 87, paragraph 1).

Civil code of Ukraine establishes certain requirements to the name of the legal entity - it should contain information about the legal form of the legal person, character of activity, it is possible to have abbreviated company name (article 90).

In turn, the Civil code defines the data that is entered into the state register: «...made information about the legal form of the legal entity, its name, location, management bodies, branches and representative offices, the aim of the institution» (article 89, paragraph 4).

Thus, the definition of a class «a legal person» will:

```
Type legal_person= class (...),
Identification_code_LP: IDLP,
name_LP: NLP,
abbreviated_name_LP: ANLP,
brand_name_LP: BNLP,
organizational_legal_form_LP: OLF,
date_of_registration_LP: DRLP,
location_LP: LLP,
constituent_document: CDLP,
```

license: LLP,
End.

For the enterprises of the coal industry, there are the following legal forms: public and private. This means that the attribute "organizational-legal form" (OLF) will be the value from the following set: {state, private}.

Location of the legal person is determined by several attributes: code, city, street, house number, etc., to display uses structured record-such types (record, class).

The constituent documents of a legal person is the articles of Association, Memorandum of Association or the deed of Foundation. For the characteristics of these documents need structured data types (record or class).

So classes «enterprise», «legal_person», «coal_mining_enterprise» and other classes that correspond to the types of enterprises by activity, are portraits of elements on a layer of enterprises. Classes of enterprises by kinds of activity are created during the development of the software product (SP). Instances of a class are created using a dynamic array whose elements are defined and added during the exploitation SP.

The peculiarity of this layer is the fact that enterprises have a connection only if they belong to the same state (territorial) of the enterprise. To reflect these links will use the adjacency matrix, in which the number of rows and number of columns is the same and is the number of enterprises. Clarification of the information about such relationships requires the introduction of a separate class that деталізуватиме their characteristics, e.g.:

```
Type communication_of_enterprises = class
(...)
enterprises_1: E1,
enterprises_2: E2,
Object_communication: CO; / material or
other
documentation: CD,
responsible: Resp,
performers: Perf,
start_date: SDate,
end_date: EDate,
End.
```

At the object-oriented approach modeled not the specific domain entity, but their portraits, which are relevant to the specific layer. Each portrait requires allocation of relevant characteristics, classification and integration to one class.

Consider layer divisions. Elements of this layer is the division, communications of that layer

show the transfer of tangible objects, normative documents, information flows. With the purpose of regulation of activities of structural subdivisions and their place in the organizational structure of the enterprise, the owner or authorized body shall develop, approve and implement the provisions of each of them. According to its status, provisions on structural subdivision is an internal regulatory document, on the basis of which organizes daily activities of the structural unit, evaluate the results, write job descriptions that define the tasks, functions, rights and duties, and the main responsibility of the employees [21].

Regulations about structural division of the enterprise, as a rule, develops a division head or a working group of specialists in the field of management, labour law and relevant activities of the company.

In the case of redistribution of functions between the divisions in connection with the reorganisation (change of structure) of an enterprise changes (amendments) in the regulation on structural subdivision can be made only by the manager of the enterprise.

Regulations on structural division replaced and re-approved in case of change of name of the enterprise or division.

Regulation about the division consists of the following parts: general provisions, tasks, functions, rights, responsibilities, relationships with other divisions.

Class «division» should have the following definition:

```
Type division= class ()
Direct_subordination_of_division: DSD;
The_position_of_the_head_of_division:
PHD;
The_position_of_the_deputy: PD;
Availability_of_printing: AP;
List_of_positions_division: LPD;
monthly_wages_fund: MWF;
End.
```

Types of data used to describe the fields in the class, have the following meanings: DSD – name of the position, which the division is subordinate, takes values from the set list of posts in the enterprise, the type of set; PHD, PD та LPD – similar to the previous one variable; AP – can have one of two values (yes or no), the type of boolean; MWF – the positive integer, the type of word.

Each division has its own intrinsic characteristics, for example, for the coal-mining division is planned average daily production volume, planned number of workers, average

dynamic take out capacity of the coal layer, the angle of incidence of the mined seam, the depth of the works, the type of mechanization, mode of operation, the group of the payment. In addition to the above it is necessary to take into account the actual indicators of activity, namely: the actual daily average volume of a coal mining, the actual number of workers, and the monthly wage fund. Such characteristics of the units have a different type, represent a separate class:

Type division_of_coal-mining = class (division),

Planned_average_daily_volume_of_extraction: PADVE,

Actual_daily_average_volume_of_production: ADAVP,

Planned_number_of_workers: PNW,

Actual_number_of_workers: ANW,

Average_dynamic_take_out_capacity_of_the_coal_layer: ADTCCL,

Angle_of_incidence_of_the_mined_seam:

AIMS,

Depth_of_the_works: DW,

Type_of_mechanization: TM,

Mode_of_operation: MO,

Group_of_the_payment: GP,

Monthly_wage_fund: MWF,

End.

Тут PADVE, ADAVP, PNW, ANW, ADTCCL, AIMS, DW, MO, GP, MWF – the positive integer type, for example, word; TM – can have the following values: «2 КД-90» or «2 КД-90, 1 К-101 Y», therefore, choose a data type string.

The basis for creating classes that define the essence of a «division» is a normative documentation. General, organizational information, take from the «Provisions about division» and technical, production data - from the staffing, technical documentation and other. Each document is a element layer document management, some of the attributes of these elements are used as element of attributes of other layers, for example, the monthly salary fund counts accounts department, adds to the staffing and such an attribute has a class of «division».

Developed DB model is static, so as adding new classes during operation SP impossible. The number of instances of classes is not limited. However, considering the following conditions: all enterprises have a close, a similar structure, this structure over time, changes slightly, the number of departments of all enterprises limited [3], use of the DB with a static definition of the types is reasonably.

CONCLUSIONS

Developed information model to store the results of the monitoring informatively-administrative architectures of the coal-mining enterprises, allocated object-oriented data structures. Marked features information models, databases for the coal-mining enterprises.

Certain data structures reflect the informational, technological, functional characteristics of the entity IAA, take into account both the separation of the layers and their interrelation. Built information model reflects the coherence between and interrelation of characteristics of information and administrative subsystems. Such a data structure is the basis for building databases, models of the dynamics of IAA, predicting its further development.

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СТРУКТУРЫ ДАННЫХ В МОДЕЛЯХ
ИНФОРМАЦИОННО-УПРАВЛЕНЧЕСКИХ
АРХИТЕКТУР УГЛЕДОБЫВАЮЩИХ
ПРЕДПРИЯТИЙ

Светлана Шевченко

А н н о т а ц и я . В статье представлены структуры данных информационно-управленческих архитектур, эти структуры обеспечивают возможность эффективно и всесторонне исследовать угледобывающие предприятия с использованием информационных технологий, хранить и анализировать результаты мониторинга. Разработанные модели и структуры данных позволяют определить наиболее эффективные архитектуры и распространять их с использованием современных информационных технологий.

К л ю ч е в ы е с л о в а : информационно-управленческая архитектура, слой, информационная модель, отношения, структуры данных, структурное подразделение.