

Technical characteristics of MLIS and MNIS MBO 1.0

The names of the proposed software products are: **Multilingual local instrumental system of Ministry's budget optimization**, version 1.0 (MLIS MBO 1.0), and **Multilingual network instrumental system of Ministry's budget optimization**, version 1.0/upc (MNIS MBO 1.0/upc).

1. General characteristics of the products

1.1. Business benefits

Allowing any interested users, which communicate in their life in any languages, to quickly solve their tasks of optimizing budgets, that are developed on the basis of program-target planning.

1.2. Products positioning

Markets of software and network computing services to solve tasks of optimizing budgets.

1.3. Information about users

Potential users of MLIS MBO 1.0 and MNIS MBO 1.0/upc are all those persons and organizations which develop budgets on the principle of program-target planning.

2. Products overview

Programs **MLIS MBO 1.0** and **MNIS MBO 1.0/upc** are purposed to find the best (optimal) budgets of ministries and other government departments, agencies and entities, as well as complex targeted programs, which development is based on the principle of program-target planning (PTP), widely used in budgeting. PTP - is such kind of planning, which is aimed to achieve the set objectives when at first are determined and set the goals and then are selected the ways to achieve them. PTP is built on logic "goals → ways → methods → means". First, are set goals to be achieved, then are outlined the ways of realizing them (action items), and then - more detailed methods and means (goods and services).

MLIS/MNIS MBO 1.0 are multilingual programs. Alternative languages of their interfaces are stored in separate files, called *language shells*. These programs include two such shells: Russian and English, as well as a special program of version 1.0 called "**Генератор языковых оболочек (ГЯО 1.0)** (Generator of language shells (GLS 1.0))", that allows users themselves to create such shells for any languages in which they usually communicate.

MLIS is offline program, designed for a particular user (lite version of this program is free).

MNIS is purposed to provide network services to many users. This system consists of two parts: one remote module of optimization (MO), which is a part of the Universal processing center (UPC) 9 MNIS 1.0 (that is why the suffix "/upc" is indicated in the name of this MNIS), and numerous automated work places (AWPs) targeted at specific MNIS users. Each such AWP is designed to prepare by a separate user the input data of the tasks to be solved and to output the calculation results, and the synthesis of optimal budgeting strategies takes place in the MO. Information link between AWP and MO can be carried out via the Internet, over the local network or even on the computer bus of a single user of AWP. In the first and second cases MO is located on the network server, and in the third - on the computer of the indicated user. At that, there is ensured the operativeness and full automation of the AWP interaction with this module.

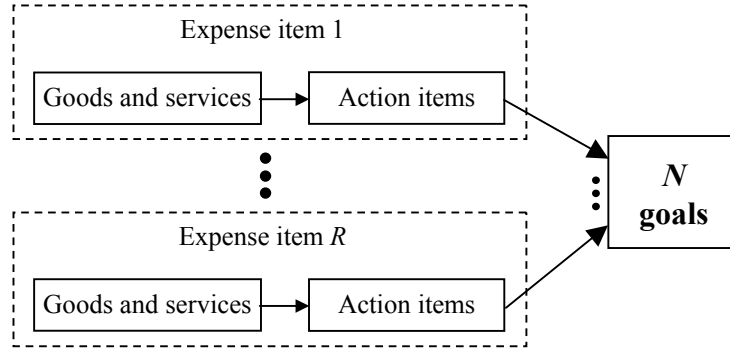
MLIS/MNIS MBO 1.0 are created on the basis of a new science-intensive information technology of automation of control of discrete technological and information processes (IT AC DTIP), having many uses, the founder of which is the author of these multilingual programs. A set of lite version of MLIS MBO 1.0 can be downloaded from any of two websites of the author: "Promotion center of IT AC DTIP" (<http://promo.dtip-optim.com/en>) and "Implement. center of IT AC DTIP" (<http://dtip-optim.com/en/main>). There also the user can solve remotely up to 10 test tasks in MNIS MBO 1.0/upc.

Areas of possible use MLIS/MNIS MBO 1.0 are various bodies of state, local, and corporate governments that are engaged in budgetary process.

Year of release MLIS MBO 1.0 and MNIS MBO 1.0 - 2015 (year of MNIS update to version 1.0/upc - 2018). Place of development - Kiev (Ukraine).

3. Products functions

The figure below shows a flowchart of PTP that was realized in MLIS/MNIS MBO 1.0. Its terms are the goods, services, action items, and goals. The connections between goods and services (lower level of hierarchy), action items (middle) and goals (top) are set here with the help of weighting factors. Every group of action items of specific destination, which are realized via selected goods and services, is financed by certain expense item. The financing amounts for these items are those restrictions which are imposed in finding the optimal solution.



Figure

MLIS/MNIS MBO 1.0 allow to solve a task of finding the optimal budget, formalized setting of which is shown below. It is based on the method of numerical optimizing discrete service processes, as well as on the unique scheme of optimizing these processes, that was developed by the creator of these programs.

Given:

- N - number of set goals;
- $\{w_k, k = \overline{1, N}\}$ - array of weighting factors of goals, where $0 \leq w_k \leq 1 \forall k$;
- M - total number of action items in achieving all goals;
- R - number of expense items;
- for r -th expense item, $r = \overline{1, R}$, given:
 - C_r - financing sum on this expense item;
 - m_r - number of action items financed on this expense item, where $\sum_{r=1}^R m_r = M$;
 - for i -th action item, $i = \overline{1, M}$, given:
 - $\{v_{rik}, k = \overline{1, N}\}$ - array of degrees of influence by action item at goals, where $0 \leq v_k \leq 1 \forall k$;
 - L_{ri}^t - number of goods types;
 - for j -th type goods, $j = \overline{1, L_{ri}^t}$, given:
 - n_{rij}^t - number of alternative varieties of this goods type;
 - for x -th variety of a goods type, $x = \overline{1, n_{rij}^t}$, given:
 - s_{rijx}^t - cost of a sample of goods of this variety;
 - $m1_{rijx}^t, m2_{rijx}^t$ - minimum and maximum numbers of samples of goods required for action item execution;
 - $a1_{rijx}^t, a2_{rijx}^t$ - degrees of influence of minimum and maximum numbers of samples of goods at execution of action item;
 - L_{ri}^u - number of services types;
 - for j -th type service, $j = \overline{1, L_{ri}^u}$, given:
 - n_{rij}^u - number of alternative varieties of this services type;
 - for y -th variety of a services type, $y = \overline{1, n_{rij}^u}$, Asked:

- $c1_{rijy}^u, c2_{rijy}^u$ - minimum and maximum costs of a service required for action item execution;
- $a1_{rijy}^u, a2_{rijy}^u$ - degrees of influence by services of minimum and maximum costs at execution of action item.

We introduce the following notation:

- φ_{rijx} - selectable number of samples of goods of x -th variety j -th type, related to i -th action item, that is financed by r -th expense item;
- s_{rijy}^u - selectable cost of a service of y -th variety j -th type, related to i -th action item and r -th expense item.

The following task is set: it is necessary to find such arrays of parameters $\{\varphi_{rijx}, \forall x, j, i, r\}$ and

$\{s_{rijy}^u, \forall y, j, i, r\}$, at which is maximized the next global quality criterion: $G = \sum_{r=1}^R g_r$, where

$$g_r = \sum_{k=1}^N w_k \cdot \sum_{i=1}^{m_r} v_{rik} \cdot \left[\sum_{j=1}^{L_{ri}^t} (a1_{rijx}^t + (a2_{rijx}^t - a1_{rijx}^t) \cdot \frac{\varphi_{rijx} - m1_{rijx}^t}{m2_{rijx}^t - m1_{rijx}^t}) + \sum_{j=1}^{L_{ri}^u} (a1_{rijy}^u + (a2_{rijy}^u - a1_{rijy}^u) \cdot \frac{s_{rijy}^u - c1_{rijy}^u}{c2_{rijy}^u - c1_{rijy}^u}) \right] \forall r,$$

provided imposing the following restrictions:

$$\sum_{i=1}^{m_r} \left(\sum_{j=1}^{L_{ri}^t} s_{rijx}^t \cdot \varphi_{rijx} + \sum_{j=1}^{L_{ri}^u} s_{rijy}^u \right) \leq C_r, \quad r = \overline{1, R}.$$

4. Restrictions

- maximum number of goals - **100** (for lite version of program MLIS MBO 10 - **10**);
- maximum total number of action items to achieve all the goals - **5000** (for lite version of MLIS - **100**);
- maximum number of expense items - **25**;
- maximum total number of types of goods or services - **65000** (for lite version of MLIS - **1000**);
- maximum number of types of goods or services on each action item - **500**;
- maximum number of alternative varieties of each goods or service - **5**;
- permissible number of phase states of optimized process (it is available for control by user) - **1000000** (for lite version of MLIS - **20000**);
- maximum number of increments of one service cost - **100**.

5. Practical application

MLIS MBO 1.0 and MNIS MBO 1.0 were put into operation in October 2015 (MNIS was updated to version 1.0/upc in July 2018). Now comes the stage of the search for potential dealers and users of these systems.

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