THE COMPLEX UNIFIED EVOLUTIONARY APPROACH TO THE CREATION OF THE MULTILEVEL DISTRIBUTED CONTROL SYSTEM OF A GAS-TRANSPORT COMPANY

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Abstract: the objects of a large-scale gas-transport company (GTC) suggest a complex unified evolutionary approach, which covers basic building concepts, up-to-date technologies, models, methods and means that are used in the phases of design, adoption, maintenance and development of the multilevel automated distributed control systems (ADCS).. As a single methodological basis of the suggested approach three basic Concepts, which contain the basic methodological principles and conceptual provisions on the creation of distributed control systems, were worked out: systems of the lower level (ACS of the technological processes based on up-to-date SCADA), of the middle level (ACS of the operative-dispatch production control based on MES-systems) and of the high level (business process control on the basis of complex automated systems ERP).

Keywords: gas-transport company, distributed control system, concept of the creation of the complex distributed control system, unified integration platform, adaptive expandable data-pump, modified FDD-design-technology, evolutionary strategy, corporate maintenance methodology.

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Introduction

The main characteristics of the up-to-date gas-transport enterprises as control objects are:

- ramified, multilevel, geographically distributed (more than 37 000 km) logistical structure;
- continuous, technically difficult and explosive technology of gas transportation through high-pressure pipe main lines;
- essential influence on the country's economy (considerable percent of the government budget input of the country).

That's why considerable reliability, increase of effectiveness and safety of the gas-transport system based on the creation of a complex multilevel distributed control system is a very important and an actual task.

The principal logistical, technological and economic characteristics of the up-to-date nets of the gas mains and gas-transport enterprises it is necessary to take into account as control objects

1.The creation concept of distributed ACS TP based on modern SCADA

In 2005-2006 the research and development institute of the gas-transport ACS worked out the"Creation concept of the automated distributed control systems of technological processes (ADCS TP)" for the enterprises of the national stock company (NSC) "Neftegaz Ukraine" (further the ADCS TP Concept).

This first basic conceptual document was adopted as a normative-methodological branch standard. It contains the basic methodological principles, functional requirements and conceptual provisions on the creation of distributed control systems: of the lower level (ACS of the technological processes based on up-to-date SCADA).

Nowadays the ADCS TP Concept is rather widely used by all design organisations and developer companies for unification, standardization, quality improving and increase of effectiveness of designing new means and modernization of present ones, complexes and automatization systems of technological objects and also for

solving one of the most important problem of system-wide integration of all interstitial local systems into one complex distributed control system based on using where possible unified type decisions, which passed preliminary testing.

2. The creation concept of complex ACS of business processes based on ERP system

In 2006-2007 the institute worked out the "Creation concept of complex automated control systems (CACS) of the basic business processes (BP) of the national stock company (NSC) "Naftogaz Ukraine" (further the CACS BP Concept).

This second basic conceptual document was also adopted as a normative-methodological branch standard that is used by the creation of systems of the upper level of hierarchy of managing the company. CACS BP Concept contains complex hierarchial analysis of all basic occupations and business processes of enterprises, which affiliate the company, basic principles, system-wide and specialized requires, and also the main conceptual provisions on the creation of CACS BP as a complex distributed system: the upper level of managing the company.

In the CACS BP Concept the method of building of its basic part (data-pump) based on buying and implementing of a complex highly parametrized "brand name" from the system Enterprise Resource Planning (ERP) was chosen substantially. Nowadays as basic ERP-system was substantially chosen SAP Enterprise Business Suite Companies SAP AG.

3. The creation concept of ACS of the operative-dispatch control based on MES-systems

In 2007 the institute worked out the "Creation concept of automated operative-dispatch control system for the subsidiary company (SC) "Ukrtransgaz" on the basis of MES-sytem (further the MES Concept).

This third basic conceptual document is ment for the creation of systems of the middle level of hierarchy of managing the company. MES Concepts cover also analytic description of all main functions of the system of this kind, review of the main range of application and the main members of the domestic and external economic markets of the most famous developers of these systems.

Thereby after the creation and confirmation of the MES Concept as a common a normative-methodological branch basis all main hierarchy levels of managing the objects of the Ukraine's gaz-transport system.

4. The modified flexible Feature-Driven Development

For the effective support of the design phases and the software engineering (SW) of a complex multilevel distributed control system of the gaz-transport company the modified Feature-Driven Development (mFDD) based on expanded for the creation of multilevel distributed applications from the pattern library (design patterns) is suggested. In addition the modification of the methodology aimed at creation of the set of unified methodologies and technologies oriented on engineering specificity of the modern three-level distributed management-information systems.

The suggested methodology m FDD bases on the following systems engineering principles. The software engineering is represented as a single integral system process containing a set of EFT and the developers of these projects. For a well-organized low-level working at the project the unified FDD-batches are used as instruments for the automated engineering documentation and the realization of the unified basic processes within the projects.

5. The evolutionary strategy and the corporative creation and adoption technology of the system

As a principle of the creation and the adoption of ADCS GTC the evolutionary strategy was taken, that realizes the modern screw model of the system's creation.

The practical realization of the suggested evolutionary strategy bases on the multiphase technology of the EFT-engeneering. In the first phases as a result of the realization of basic EFT a common expandable data-pump of the system based on the adoption of the chosen set (batch) of the universal purchased parametrized components is created. In addition in the first phases the integration of new and inherited applications is carried out.

In the further phases the expansion of the data pump functions and also the engineering, integration and adoption of the new applications , which automatize isolated, specific and ad-hoc functional task complexes.

For the efficient regulation, unification and standardization of realization of the suggested evolutionary strategy the common corporate methodology control of the system's project maintenance control was worked out.

For a more convenient application by users (project teams) a burst of normative-methodological documents was created, which includes user guide, interactive handbook on how to use the principal provisions of the methodology, tutor with many working models.

Conclusion

As a result of the pursued researches a range of conceptual, methodological, strategic provisions and engineering developments was suggested, it allows ensuring of efficient support of the engineering processes, design, adoption, maintenance and development of multilevel distributed control systems aimed at the gay-transport branch.

To support the design phases and the phases of speciality application-dependent software of ADCS GTC efficiently a modified FDD-methodology based on expanded for the creation of multilevel distributed applications from the pattern library (design patterns) is suggested. As a principle of the creation and the adoption of ADCS GTC the evolutionary strategy was taken, that realizes the modern screw model of the system's creation. For the efficient regulation, unification and standardization of realization of the suggested evolutionary strategy the common corporate methodology control of the system's project maintenance control was worked out.

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