Development of Effectiveness Method of Wireless Segments in Information System

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Abstract: This research aiming is more efficient information system on the basis of the development and practical application of methods and models that enable the preliminary assessment of the feasibility of wireless segments (WS) or the choice of rational structure of WS. Thus, the comprehensive evaluation of the effectiveness of the proposed options for the structure to use the wireless segment in the information system that we consider is the actual problem. To Developing a method of assessing the efficacy of WS in the information system which is the basic method of evaluating options for the structures is the method of WS activity-based costing. By using developed and the proposed methods and models for reducing time-consuming complexity of work with a preliminary assessment of whether to apply a different option structures WS, increase the efficiency of the preparation of recommendations on the choice of rational structure of WS among the options for upgrading or development of IP business or organization. In this paper, methods have been used for assessing the efficacy of RBCs in the information system. The research focused on efficient information system on the basis of the development and practical application of methods and models that enable the preliminary assessment of the feasibility of WS or the choice of rational structure of WS.

Keywords: WS - wireless segment; AP - Access Point; WM- wireless modem; LS local server; CA – cover area.

\textbf{1- Introduction}
Nowadays intensive development of wireless network technologies are widely uses data network Wi-Fi protocols under the direction of IEEE 802.11. Configuration and composition of the technical means for the organization of the wireless segment (WS) information system requires the development and application of theoretical and practical methods justify the deployment of the project work efficiently organized and effective working WS during their interaction with the information system based on fixed wireline enterprise networks.[1]As of modern personal computers and telecommunications hardware, usually equipped with modules Wi-Fi, opens the potential of increasing quality of service as mobile employees and customers who interact with or maintained by the company. Among the various proposals the developer must choose a unique technical solution for topological, structural, economic indicators appropriate to the empirical or expert positions. The decision to deploy the wireless segment to administration leads to reasonable settlements with the technical, economic and social efficiency.
Thus, the development of models and methods for comparative analysis of the technical solutions that are designed and comprehensive evaluation of the effectiveness of the proposed options for the structure to use the wireless segment in the information system that we consider are the actual problem.

At present, the automation of business processes of enterprises and organizations is becoming more and more an irresistible task. The development of modern information systems requires careful design, modeling and often requires the consequences of student’s academic progress accounting modification of existing business processes. [2]

Modern trends in the development of IT sector pay special attention to reducing unproductive expenses of IT projects. One way to reduce these costs is to maximally accurately identify the content of an IT project during its initiation and planning. Solving this task is typically considered as part of the work to build and analyze the requirements of stakeholders to the created system.

However, the existing methods, models and information technologies that are used during the solution of traditional problems of finding sustainable solutions that arise when deploying WS in information system company, focused only on individual research problems of wireless systems, without considering the usually WS as part of the information system, associated features, and therefore do not represent the possibility of a systemic solution the problem of choosing a rational structure of WS in the information system.[3]

2- Implementation of WS in the information system

Analyzing the current state of development of the enterprise, which makes it possible to get extra functionality or improve the current state of information systems. One of today's decisions is the deployment of WS, whose organization in the information system can provide services to both internal company personnel and clients and visitors, offering them additional services. Analysis and decision on the feasibility of the modernization of the information system of wireless technologies, including Wi-Fi, and deployment of WS requires the ability to conduct the appraisal stage of modernization of the preliminary technical and economic evaluation. [4] Thus, there are three classes of organizational and technical implementation of WS in the information system is presented in Figure (1).

![Figure 1: Classes of organizational-technical realization of WS in MS](image-url)
Where WM refer to wireless modem, WS refer to wireless segment; AP refer to Access point, LS refer to local server, PC refer to Personal computer, CA refer to cover are; and \( r \) refer to the number of users groups.

The main features of the first class is to limit the number of users the same category who are in the same room, and turning to the access point with a distance zone (option 1) or for each user conventionally known distance zone (option 2) or limited number of users of different categories, which are in the same room and turn to a TD from one zone to the distance (option 3) or for each of the different categories of users known to conditionally zone the distance from the AP (option 4).

The second class consists of the implementation of WS for geographically distributed enterprises, characterized by different categories of users with a certain remoteness from multiple access points, then have four options (as well as first class) for each of the existing access points in various combinations for all access points wireless segment can take place.

The third class consists of the implementation of WS for geographically distributed enterprise, which possesses all the characteristics of the second class, as well as characterized by the fact that different categories of users have an indefinite distance from many points of access to the segment, and then there is a movement of users between zones of different categories of remoteness.

Analysis of data exchange processes in the information system in order to deploy it WS advisable to carry out the groups of parameters: information, topology, user and technology. Defining a set of parameters is the basis for further evaluation. The analysis of existing methods for evaluating the effectiveness of the information systems. WS as part of an information system can be estimated based on the information system after its implementation, or estimated by analogy with the current WS in other similar information system, some methods provide the most relevant in this case - preliminary (for the deployment of WS in the information system in the company). Generalization of the results of the analysis methods provides a basis for selecting a group of methods that are based on value analysis that is based on simulation results. [5]

The results of the analysis of the problems of developing WS in the information system allows the conclusion to the account of the prospects of development of models for assessing the functionality of the WS in information system, the formation of a generalized criterion for evaluating and developing a method of assessing the efficacy of WS of defined structure in the information system in order to choose a rational decision. Definitely the main direction of research, as the creation of methods and models to assess the efficacy of WS in the information system.

Thus, this problem becomes particularly acute for wireless technologies. A number of reasons confirm the need to consider the feasibility of wireless technologies: Developed leases, leading to periodic changes in the topology of the premises; Flexibility of wireless networks; High performance of modern wireless technologies; A permanent reduction in the cost of equipment for wireless communication and the expansion of its range; Increasing demands for quality work and service for staff and for potential visitors or customers of the enterprise. Thus, the process of developing or upgrading enterprise information system and organization is targeted. [6]

The analyzes and identifies the main functions of the wireless segment: give the user a permanent channel of communication services in the territory of the necessary number of users willing, able to communicate the desired volume, providing the service time limit for different categories of users, etc. The procedure of forming different WS variants of structures is performed according to the scheme in Fig.2.1
3- Materials and methods

Developing a basic method of WS activity-based costing that assessing the efficacy of WS in the information system to evaluating the options for the structures. Proposed a general criterion includes in its membership the normalized components of performance and value, and takes into account the exchange of data using wireless technology, time limits on the duration of the exchange and to limit the number of users that should be given quality service. [7]

For the embodiment of the technical structures of \{Si\}, \( E_{si} \) component efficiency depends on the normalized values of the possible number of concurrent users to the WS, with each of which belongs to the j-th category of species data and their volumes, the time interval for each service \( \Delta t_{ij} \) mobile user, and possibly other characteristics and parameters. [4]

\[
E_{si} = a_1 \frac{N_i - N_{min}}{N_{max} - N_{min}} + a_2 \left[ 1 - \sum_{j=1}^{N_i} a_{2j} \frac{\Delta t_{ij} - \Delta t_{jmin}}{\Delta t_{jmax} - \Delta t_{jmin}} \right]
\]

- \( N_i \) – Possible amount of user requests of I variant;
- \( N_{min}, N_{max} \) – min and max numbers of mobile users;
- \( \Delta t_{ij} \) – time intervals;
- \( \Delta t_{min}, \Delta t_{max} \) – min and max time intervals;
- \( a_{2j} \) – coefficient of information importance

\( C_{si} \) cost component depends on the normalized values and the second variant, for example, the value of the underlying wireless equipment, the cost of connecting to a wired network, the cost of additional equipment, etc.
The criterion is presented as such, it contains in its composition as N components of the effectiveness of a direct influence on the general criteria and components of M with the inverse effect, as well as the P value for the different components of the cost of detention:

Rescaling data of the efficiency and the cost of the variant to have values between 0 and 1. This is usually called feature scaling. One possible formula to achieve this is called normalization. The relation between the efficiency, time interval and cost is clearly shown in figure 3. [8]

\[ C_{si} = B_1 \frac{C_{ws} - C_{ws \text{ min}}}{C_{ws \text{ max}} - C_{ws \text{ min}}} + B_2 \frac{C_{wierd} - C_{wierd \text{ min}}}{C_{wierd \text{ max}} - C_{wierd \text{ min}}} + B_3 \frac{C_{add} - C_{add \text{ min}}}{C_{add \text{ max}} - C_{add \text{ min}}} \]

\[ C_{si} \] - price of one variant;
\[ B_1, B_2, B_3 \] - importance coefficients (\( B_1, B_2, B_3 = 1 \));
\[ C_{ws} \] - price for 1 variant of wireless segment;
\[ C_{wierd} \] - price for 1 variant of weird network;
\[ C_{add} \] - prices for 1 variant of additional equipment;
\[ C_{ws \text{ max}}, C_{ws \text{ min}}, C_{wierd \text{ max}}, C_{wierd \text{ min}}, C_{add \text{ max}}, C_{add \text{ min}} \] - min and max values for studied examples.

In general, the criterion is presented as such, it contains in its composition as N components of the effectiveness of a direct influence on the general criteria and components of M with the inverse effect, as well as the P value for the different components of the cost of detention:

4- Conclusions

In this paper, methods have been used for assessing the efficacy of RBCs in the information system. The research focused on efficient information system on the basis of the development and practical application of methods and models that enable the preliminary assessment of the feasibility of WS or the choice of rational structure of WS. The comparisons between methods based on the time complexity which is the researcher’s targets. This research discussed in the literature review Analyzing the current state of development of the enterprise, which makes it possible to get extra functionality or improve the current state of information systems, The presented research Analysis of existing methods for evaluating the effectiveness of WS then developing the criterion of efficiency of WS in the information system of the enterprise. Improved efficiency criterion of WS in IS, which is different from the existing functional-cost test that allows assessment of structural solutions allowing for the WS data with wireless technology, time constraints on the duration and number of users sharing. Our presented algorithm provides effective
solutions for the addressed problem which outperform the previous algorithms in most of the tackled instances.

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