DOI: https://doi.org/10.30837/csitic52021232893

Preliminary assessment on Choosing a Cloud Platform

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Abstract. *The fast progress of information technology has led to significant changes in the functionality of cloud platforms. First of all, this affected the development of cloud services. The quantity of cloud platform grows. Cloud platforms are becoming more and more different from each other. The choice of a specific platform for complex information systems is an actual task. An advanced method on the choice of a cloud platform for designing information system is proposed. The method is based on the development of existing approaches, taking into account the changes in the functionality of the platforms.*

Keywords: *Cloud Platforms, computing resources, criteria, estimation, AWS, Google Cloud platform, Microsoft Azure.*

I. Introduction and Problem Statement

Cloud technologists are becoming the mainstream in building information systems. Cloud technologies provide users with new opportunities for system deployment, data processing, and customer service. The possibility of using virtual resources, serverless solutions open up new possibilities for building systems. Cloud services give systems the flexibility to reconfigure and provide high service reliability. Despite the high cost of cloud services, they are becoming more and more attractive. The demand for such resources is very high. In turn, this leads to the emergence of more and more cloud platforms on the information services market. The task of choosing a specific cloud service provider is becoming an actual.

Currently, there are many offerings available in the cloud services market to support various services. Cloud platforms differ in the set of provided services, conceptual approach, interface, prices, etc. [1, 2, 3, 4, 5]. The interest of the business is that information services allow for a quick return on investment. Different cloud service providers expand the capabilities and functionality of their platforms.

The choice is complicated because there are many offers on the use of cloud services in the IT market. These offers have different characteristics and prices for services [1, 5, 7]. But they are open to exploration and discovery to get the best solution and find the best use case [1, 5]. In order to select the best cloud platform, all financial, functional and technical requirements for the project must be identified and prioritized for all needs. For example, Amazon offers to consider more than 160 parameters [7].

The main leaders of the modern IT market are platforms from Amazon (AWS), Google Cloud and Microsoft Azure [2, 3, 4, 5]. In the Asian market, the main leader is Alibaba Cloud (part of the Alibaba Group holding).

In the articles [12, 13] the authors proposed an analysis of the formation of estimated parameters and methods of making decision when choosing cloud platforms. Cloud platform services are evolving and the developing tasks are expanding too. Increasingly, cloud services are being used in conjunction with IoT tasks [6].

In general, the methodology [8, 9] is changing too. This article is a logical continuation and extension of the results [8, 9].

II. Problem Solution and Results

In order to choose the best cloud platform and as it was in [9], it is proposed to perform the following two phases:

1) Preliminary assessment on choosing a cloud platform;
2) Evaluate platforms according to special criteria.

We will consider only the first phase.

A. Description of the methodology.

The methodology is based on the proposals [9]. According to these proposals, we accept two phases of assessment. The first phase is preliminary assessment. The second phase is a detailed assessment.

A set of cloud platforms is being formed, which are subject to analysis $C = \{C_1, C_2, ..C_k\}$, where Cj – cloud platform (j).

The first phase includes five parameters (R_1, R_2, R_3, R_4, R_5): 1) Identify technologies (R_1), 2) Compliance with system requirements (R_2), 3) Financial policy (R_3); 4) Compatibility of the project with available resources (R_4), 5) Compatibility of the project with existing specialists (R_5). At this stage, we are preliminary evaluating the possibility of implementing the project in the cloud.

The second stage includes a detailed assessment according to other different criteria [9]. At this phase we get quantity variables. For each criterion, we use a coefficient of significance and a special expert assessments.

B. Description of the Preliminary assessment phase

1) ***Identify technologies (R1).*** In fact, this is the stage of the coverage task. On the one hand, a set (At) of technologies, protocols, programming languages is formed that are necessary for the implementation of your project. On the other hand, a similar set of platform capabilities (Ac) is formed. The problem is reduced to checking the coverage condition $At \subset Acj$, where **j** is the number of the platform under consideration. The result of this phase is a new set of cloud platforms $C^{(A1)}$.

2) ***Compatibility with system requirements (R2).*** Very often there are requirements for the compatibility of the developed system with existing ones and compatibility with the customer's requirements. A typical example - for many solutions this may be the best option - to choose AWS, but there is a customer requirement - to choose only MS Azure. The result is a new set $C^{(A2)}$.

3) **Financial policy (R3).** Financial policy is the terms and conditions for using cloud services. The financial policy is

based on a cost model. Different providers use different financial models. Payment for time, payment for traffic, payment for services, the choice of a model determines the mode of using cloud resources. When choosing, one should take into account not only the number of virtual resources of the platform (systems, clusters), but also the data processing services themselves (encryption, monitoring, communication).

Basically 2 main models are used for pricing: static and dynamic. In a static model, the price remains unchanged after it is determined; in a dynamic model, the price changes depending on the availability of resources, demand, and so on. Main indicators of a service provider (q_1, q_2, q_3, q_4. q_5), quality of service (q_1), cost of service (q_2), amount of investment (provider costs for cloud services) (q_3), resource lease term (q_4), reputation of users and providers clouds (q_5). Based on the analysis by parameters (q_1, q_2, q_3, q_4. q_5), additional set of weights for the cloud platforms is being formed $(w^{(3)}(C_1), w^{(3)}(C_2),..., w^{(3)}(C_k))$.

4) **Compatibility of the project with the available resources (R4).** This parameter is closely related to the Financial Policy parameter. Each cloud platform imposes new requirements for its use. This also applies to monetary resources, organizational resources, and conditions for security and administration.

Considering this factor, another set of weights for cloud platforms is being formed $(w^{(4)}(C_1), w^{(4)}(C_2),..., w^{(4)}(C_k))$.

5) **Compatibility of the project with existing specialists (R5).** This is a completely new metric for the use of cloud platforms. It turned out to be relevant only when using these technologies.

We are talking about the availability of certified specialists for a specific platform. The more certificates and the higher the rank of the certificates, the more preferable the choice of the platform. These conditions play a role in the formation of the cost of the project and its implementation. In this case, the weight of the preference for choosing one or another platform increases. The result of this stage is a set of weights that will be taken into account in the second stage.

Thus, the result of the first stage is the formation of a refined set of platforms that can be considered for use (C(A2)., C(A2)), the formation of sets of weight coefficients for each platform.

An example of making a preliminary assessment of cloud platforms is given.

Let it be necessary to compare seven platforms $C = \{C_1, C_2, C_3, C_4, C_5, C_6, C_7,\}$ = {AWS, Azure, GCP, Oracle Cloud, Heroku, IBM Cloud, VMWare vCloud}.

1) Let, after completing the first step, we remove C_7 = <VMWare vCloud> from the list, we get $C^{(A1)} = \{C_1, C_2, C_3, C_4, C_5, C_6\}$

2) After evaluating the "Compatibility with system requirements (R2)" parameter, we exclude the free service C5 = <Heroku> from the list. We get $C^{(A2)} = \{C_1, C_2, C_3, C_4, C_6\}$

3) The step of evaluating financial policy made it possible to form a set of weighting coefficients $(w^{(3)}(C_1), w^{(3)}(C_2), w^{(3)}(C_3), w^{(3)}(C_4), w^{(3)}(C_6))$ = (0.8, 0.6,0.6, 0.7, 0.7)

4) The step of assessing compatibility with resources made it possible to form a set of weights

$(w^{(4)}(C_1), w^{(4)}(C_2), w^{(4)}(C_3), w^{(4)}(C_4), w^{(4)}(C_6))$ = (0.8, 0.6,0.6, 0.7, 0.7)

6) Step of assessing compatibility with the available specialists. Suppose there are a few top AWS Certified Specialists, several Azure Certified Specialists, one GCP Specialist, no other Platform Certified Specialists. As a result, we form a set of weights $(w^{(5)}(C_1), w^{(5)}(C_2), w^{(5)}(C_3), w^{(5)}(C_4), w^{(5)}(C_6))$ = *(1, 0.8, 0.3, 0, 0).*

Total weights will be calculated as $(w(C_j) = 1/3(w^{(3)}(C_j) + w^{(4)}(C_j) + w^{(5)}(Cj)), j = 1,2,3,4,6.$ Finally we have $W(C) = (0.86, 0.86, 0.5, 0.47, 0,47)$

III. CONCLUSIONS

An extended decision-making methodology is proposed for a preliminary assessment on choosing a cloud platform. The methodology is based on the use of an extended system of criteria. Recommendations are given on the assessment of these criteria and the choice of weighting factors. The proposed technique can be used at the preliminary stages of the formation of the cloud architecture of the information system.

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