

MODERN CLOUD INFRASTRUCTURE: SERVERLESS COMPUTING

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Abstract: *the results of the enterprise largely depend on their volume and the level of their accounting. Therefore, a comprehensive analysis is of great importance for the effective management of the enterprise. The main contradiction in this issue is the need for management informatization and the complexity of software product development. In this regard, the introduction of cloud technologies based on serverless computing is relevant and necessary. The main sources for studying the experience of such work is the scientific literature, laws and regulations governing the accounting of the enterprise, the official materials of the financial departments, reference materials, etc. The projected practical significance of the work lies in the potential use of the collected theoretical data and research conducted in the scientific and research works of students and teachers, as well as the use of practical recommendations put forward in the work in the practice of organizations.*

Keywords: *cloud technology and infrastructure, serverless computing, enterprise accounting.*

СОВРЕМЕННАЯ ОБЛАЧНАЯ ИНФРАСТРУКТУРА: БЕССЕРВЕРНЫЕ ВЫЧИСЛЕНИЯ

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Аннотация: *результаты деятельности предприятия во многом зависят от их объема и уровня их учета. Поэтому для эффективного управления предприятием большое значение имеет всесторонний анализ. Основное противоречие в этом вопросе состоит в необходимости информатизации управления и сложности разработки программного продукта. В связи с этим внедрение облачных технологий на основе бессерверных вычислений выступает актуальным и необходимым. Основными источниками для исследования опыта такой работы служат научная литература, законодательные и нормативные акты, регулирующие порядок ведения учета деятельности предприятия, официальные материалы финансовых ведомств, справочные материалы и др. Прогнозируемая практическая значимость работы заключается в потенциальной возможности использования собранных теоретических данных и проведенных исследований в научных и исследовательских работах студентов и преподавателей, а также использование практических рекомендаций, выдвинутых в работе в практике организаций.*

Ключевые слова: *облачные технологии и инфраструктура, бессерверные вычисления, учет деятельности предприятия.*

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An effective means of optimizing the process of managing the results and processes of the enterprise today is the introduction of cloud technologies. Cloud technology is a technology of distributed data processing, in which computer resources and capacities are provided to the user in the form of Internet service at any time of day and on any channel of access to the computer network. Cloud computing is the result of a synthesis of a number of technologies [1].

As defined by the American National Institute of Standards and Technology (NIST), cloud computing is an information technology concept that involves providing ubiquitous and convenient on-demand network access to a total number of configurable computing resources (such as data networks, servers, storage devices, applications and services) that can be promptly provisioned and released with minimal operational cost or recourse to a provider. Cloud computing is characterized by availability and includes five core characteristics, three service delivery models and four deployment models [2]. The three main service delivery models include IaaS (Infrastructure as a Service), PaaS (Platform as a Service), SaaS (Software as a Service). The key feature of using different cloud service models is that, as a rule, IaaS and PaaS models are designed to solve the problems of creating and maintaining information and communication infrastructure (IT infrastructure). Accordingly, their main users are specialists of IT departments of enterprises. On the other hand, the model of SaaS is largely associated with the use of application software to solve business problems of enterprises, related to improving efficiency or optimizing the functions of the enterprise employees. And its users are enterprise business units. The main advantage of the SaaS model is the ability to both significantly reduce the amount of initial investment in hardware, software, and infrastructure (premises, telecommunications, etc.) when implementing information technology business projects, and significantly save on operating costs when solving current business problems (maintenance of premises, personnel costs, equipment maintenance, upgrading and support of functionality and software, etc.). [3]. To use the application software services within the SaaS model, the employees of the enterprise-user only need to have workstations (computers) and Internet access. In this case, the corporate user can receive services in the required volume at the moment (i.e., increase or decrease the consumption of services) and can completely abandon the creation and support of their own IT infrastructure thanks to serverless computing.

In the IT world, there are different levels of infrastructure abstraction, such as direct access to hardware resources, working with virtual machines or with containers. For some tasks, it is most convenient to completely abstract the administration functions so that the customer can run their code without having to worry about infrastructure and server management. This is the essence of "serverless computing" [4].

Serverless computing allows one to focus on the business logic without worrying about the problems associated with the infrastructure of running applications, which greatly simplifies the management of servers in the cloud. Serverless computing can be considered the last step in separating services from virtual or physical infrastructure.

Two defining characteristics of serverless technology can be identified: an invisible infrastructure instead of customized virtual machine images and a payment scheme based on actual resources consumed instead of a fixed hourly rate. The second characteristic is not new, as most cloud services already operate on this principle [5].

A pioneer in serverless computing is Amazon Web Services. In 2014, AWS released a pioneering service called AWS Lambda, in which it offered a new way to deploy web, mobile, or IoT applications in the cloud (Figure 1).

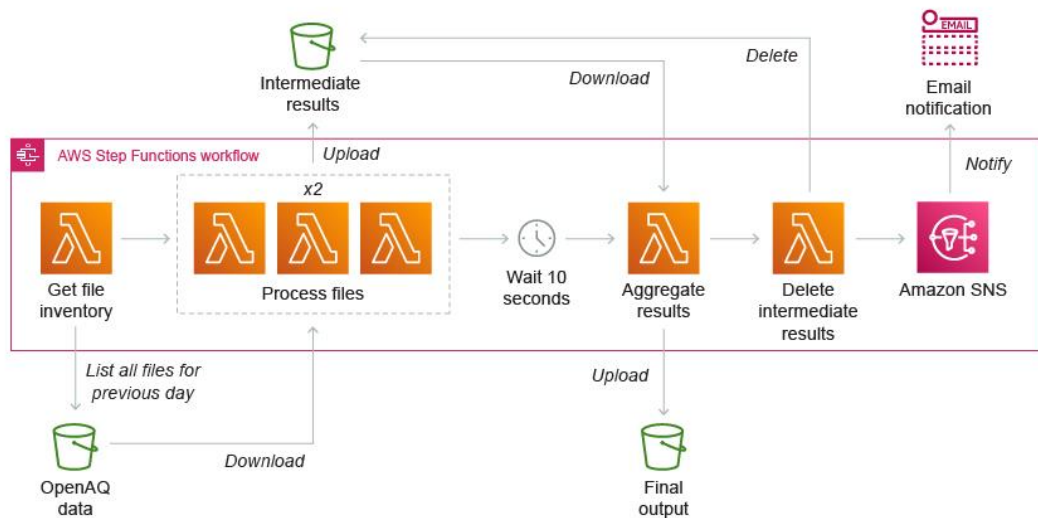


Fig. 1. Serverless Computing - Amazon Web Services

Based on the above, we can conclude that these solutions may be of interest to medium and small businesses that provide various types of information services. In this case, a small company that does not have its own resources, gets an opportunity to provide high quality IT-services of the level of a large company [6].

The introduction of cloud technology has a clear focus on improving the efficiency of enterprise management and the competent use of available resources, such as inventory, the appropriateness of professional staff activities, the scale of warehouse operations and the direction of product flows. Moreover, cloud technology makes it possible to optimize specialized flows related to the issues of obtaining reliable and up-to-date working information, ensure control over commodity flows, assortment segmentation and inventory planning, integrate financial information to optimize production costs and increase the efficiency of warehouse equipment, all types of technical facilities and available production areas. Ultimately, of course, all of the above factors are focused on ensuring customer focus and, therefore, meeting customer expectations, increasing productivity, optimizing inventory management and stabilizing sales activities as the basis for the formation of positive dynamics of profit formation of the warehouse economy [7].

The phrase "in the cloud" has already entered our colloquial language. Not so long ago, the United States government initiated a "cloud initiative" or that almost 75 percent of developers at Microsoft are currently working on cloud products, or that a phone or service stores its data in the cloud. Thus, the cloud is an amorphous entity that is supposed to represent the future of modern computing [8].

In fact, the cloud is something that has been in use for a long time; it is the Internet, along with all the relevant standards and protocols that provide a set of web services. If we paint the Internet as a cloud, one of the main characteristics of cloud computing is presented: abstraction. In the cloud, resources are pooled and distributed as needed, and communications are standards-based.

The Internet was founded as a network of networks with an architecture that was redundant and could survive massive disruption. What the original system architects of the Internet could not. The size of resources attached to it is expected to become scalable, which is the second characteristic of cloud computing.

Over the next ten years, cloud computing will impact our lives in the following ways:

1. Apps in the cloud will replace apps that are local to our devices.

2. Information will become cheaper, more ubiquitous and easier to find because the cloud makes it cheaper to scale applications and connections to always-on networks, such as wireless carriers, that make information always available.

The cloud will enable new social services by connecting users through social networks that are built using multiple cloud services. Frankly, it's hard to predict what new capabilities the cloud might provide. The cloud has a trajectory that is difficult to build, and a reach that encompasses so many aspects of our daily lives that innovation can occur over a wide range. Most people divide cloud computing into two different sets of models:

1. Deployment models: this refers to the location and management of cloud infrastructures.
2. Service models: it consists of certain types of services to which you have a cloud computing platform.

This is a very useful distinction that is now widespread. That said, you can also highlight the disadvantages of cloud computing: all cloud computing applications suffer from the intrinsic latency inherent in connecting them to the WAN. In addition, cloud computing is a system without state preservation, as is the Internet in general. For communication to survive in a distributed system, it is necessarily unidirectional.

As a means of optimizing inventory management, let's analyze the specifics of implementing the services of Business.ru [9] in the enterprise. Business.ru - a leading federal IT-company, which is more than 8 years of developing online services to automate business processes and founded one of the largest portals for entrepreneurs with the same name "Business.ru" The product of the company is a cloud service, functionality that is suitable as individual entrepreneurs (IE), and small and medium and large businesses in trade (retail, wholesale, e-commerce), manufacturing and services. The company's online-service is a cloud software solution, which complies with 54-FZ: support for more than 80 models of online cash registers, printing of receipts with comprehensive information and QR codes, the formation of electronic receipts and their guaranteed sending to customers, information exchange with the OFD, notification of failures in work. It allows entrepreneurs to automate business processes, as well as to organize effective work of sales department and warehouse (goods accounting system, CRM-system). The work process used to solve enterprise operations management problems based on cloud technology can consist of three methods:

- forecasting method;
- delivery method, i.e. evaluating the current inventory level in warehouses and forming orders on the basis of "order points";
- pricing method, which adjusts prices in accordance with the medium-term forecast of the current supply situation and the liquidity of balances [10].

In the area of organizational inventory management, the cloud infrastructure allows for procurement and inventory management in one simple program, such as receiving and shipping of goods, moving and writing off. All necessary functions and document types for warehouse operations are already entered in the system, you just need to enter the nomenclature manually or by downloading from a file and start working.

Features:

- Recording of goods (serial numbers and labeling) writing off rejects
- Generation and printing of warehouse documents (M-11, INV-3, TORG-16, MX-1, and many others).
- Bulk loading of remainders from Excel.
- Stock control in real time (purchase planning).
- Accelerated inventory process
- Automatic vendor orders
- Reservation and label printing and much more.

Business.ru cloud infrastructure warehouse management service also allows you to work with a cash register through its own cash program, integrate and maintain records in an online store, and organize the work of the sales department in an embedded CRM-system.

1. Carry out inventory taking in the warehouse.

Only a few actions are required to carry out an inventory of the warehouse:

- Automatic creation of a list with accounted balances in the "inventory" document
- Entry of actual balances
- If there are deviations, quick transition to write-off or entry from the inventory document, etc.

Automatic orders to suppliers.

The "minimum balance" function helps to generate automatic orders to suppliers before goods run out. You can also set up automatic purchases based on sales analysis for a specific period.

3. Easy and convenient work with the documents lies in the following features of the serverless cloud computing system:

- Only actual unified forms: invoices, sales receipts, delivery notes, TORG-12, TTN, certificates, invoices, cash vouchers, commissioner's reports and many others.

- Automatic numbering, mass printing, document archive.
- Built-in email client for sending by email.
- Ability to edit templates and upload your own document templates.

4. Stock reservation.

The system allows you to manage an unlimited number of warehouses and directly in the system to carry out the formation of internal orders. Form an internal order and resend it to the supplier is quite simple. The document is

created from an existing internal order. The service has a special reservation module, which automatically creates reserves, calculates the balances and does not allow you to sell the reserved goods during the following operations.

5. The development of technological charts with automatic writing off of used materials. Kitting (analog of the flow charts) can be used in productions, catering and other areas, which require assembling (manufacturing) goods from the components available in stock. The materials used for kitting will be written off from the warehouse automatically.

It is also possible to conduct the reverse operation, when it is required to disassemble the goods into component parts. Such operations may be required, for example, in warehouses for spare parts.

6. Integration, equipment and data exchange service includes:

- Barcodes: support for scanners, printing and generation of EAN-8, EAN-13, Code128, etc.
- Connection of printers to print price tags and labels.
- Integration with fiscal registrar and cash registers with support of 54-FZ.
- Uploading data to 1C: Accounting for tax reporting.
- Integration with online stores and other services (SMS-mailing, telephony, statistics systems, etc.).

7. Features of Business.Ru cloud service for inventory management:

- Editing any printed forms of documents, adding a logo, seal and signature, custom document templates
- Printing out product images, for example, in price lists or documents
- Highlighting the quantity of the goods in the documents if it is less than in stock
- Receiving mass payments for orders, invoices and delivery notes
- The division of payments into Due and Completed for creating future payment plans
- Automatic update of provisioning when customer order changes
- Pass-through log of comments to documents with possibility of linking files, images
- Saving of different purchase prices for different suppliers
- Fast saving of prices after downloading of consignment note
- Fast conversion of prices from one currency to another according to Central Bank rate or fixed rate in the system
- Classification of goods into modifications (product lines by colors, sizes, etc.)
- Transfer of unnecessary goods "into archive"
- The binding of goods to storage bins, sections, etc.

Since these functions are necessary for the accounting of the enterprise, the analysis of the cloud infrastructure based on serverless computing is important to study. These results show how efficiently existing resources are being used and what growth potential can be expected in the future. The implementation of cloud technologies has a clear focus on improving the efficiency of enterprise management and the competent use of available resources, such as inventories, the appropriateness of professional staff activities, the scale of warehouse operations and the direction of commodity flows. Moreover, cloud technology makes it possible to optimize specialized flows related to the issues of obtaining reliable and up-to-date working information, ensure control over commodity flows, assortment segmentation and inventory planning, integrate financial information to optimize production costs and increase the efficiency of warehouse equipment, all types of technical facilities and available production areas. Ultimately, of course, all of the above factors are focused on ensuring customer focus and, therefore, meeting customer expectations, increasing warehouse productivity, optimizing inventory management and stabilizing sales activities as the basis for the formation of positive profit dynamics.

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