



Universitatea Tehnică a Moldovei

SERVICIU PENTRU CONTAINERIZAREA MEDIILOR DE DEZVOLTARE ÎN CLOUD

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REZUMAT

În prezent, odată cu creșterea popularității tehnologiilor cloud, din ce în ce mai multe afaceri își migrează produsele IT pe infrastructuri cloud, pentru a depăși problemele de scalabilitate. În același timp, dezvoltarea software cel mai des se realizează pe stațiile personale de lucru a dezvoltatorilor, ceea ce poate duce la mai multe probleme în timpul fazelor de realizare, de testare sau de producție din ciclul de dezvoltare a produselor software.

În această lucrare este cercetat dacă dezvoltarea software poate avea loc în containere software plasate în cloud și care sunt posibilitățile și oportunitățile pentru așa metodă. Un studiu comparativ al soluțiilor existente pe piața mediilor integrate de dezvoltare cloud a arătat că majoritatea soluțiilor funcționează după modelul platform-as-a-service, cu suport pentru containere software și aplică modelul plăților lunare pentru servicii.

A fost propusă o arhitectură de referință pentru medii de dezvoltare cloud, luând în considerație scalabilitatea, securitatea și UX. De asemenea este propus un prototip de mediu de dezvoltare cloud dezvoltat conform arhitecturii proiectate. Prototipul demonstrează că este posibilă dezvoltarea completă și securizată a produselor software într-un spațiu de lucru în cloud.

Teza este compusă din 3 capitole. În capitolul 1 este prezentată analiza domeniului și plasarea mediilor de dezvoltare cloud în domeniu. Este prezentată o analiză comparativă a soluțiilor existente. În capitolul 2 este arătată arhitectura de referință a unui mediu de dezvoltare cloud, cu descrierea detaliată a fiecărei componente majore. În capitolul 3 este descrisă implementarea unui mediu de dezvoltare cloud care poate fi rulat utilizând o infrastructură cloud hibridă, după modelul platform-as-a-service.

Cuvinte-cheie: tehnologii cloud, containere, orchestrarea containerelor, medii de dezvoltare.

ABSTRACT

Nowadays, with the advent of cloud technologies, more and more businesses switch to cloud infrastructures to run their products in order to circumvent scalability issues. Meanwhile, the development of software happens usually on developers' personal workstations, which leads to many issues during the development, testing or production phases of software development cycle.

In this paper it is researched whether software development itself can happen in a cloud in dedicated software containers and what are the possibilities and opportunities of such approach. A comparative study of existing solutions on the market of cloud integrated development environments (cloud IDE) and what are their offerings is performed. The comparison of cloud IDEs shows that the most of cloud IDEs run a platform-as-a-service model, with support for software containers, employing monthly payments model.

It was proposed a reference architecture for a cloud IDE solution, with scalability, security and user experience concerns in mind, that fully covers the characteristics of cloud applications. Later in the paper it is also proposed a proof-of-concept implementation of cloud IDE according to the proposed architecture. The prototype shows that it is possible to have full access over a software container deployed in the cloud from a simple web browser, in a secure manner.

The paper is composed of 3 chapters. In chapter 1 it is presented the domain analysis and the placement of cloud IDEs in the domain. A comparison of existing solutions is presented. In chapter 2 it is shown a reference architecture of a cloud IDE, with detailed description of each of its major components. In chapter 3 it is described a proof-of-concept implementation of a cloud IDE that can be deployed to a hybrid cloud infrastructure, following platform-as-a-service cloud model.

Keywords: cloud technologies, software containers, container orchestration, IDE.

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INTRODUCTION

In the current days the demand of IT services is unsurprisingly high and IT professionals have to develop the software with a faster pace than they did in the past. This motivates IT communities and companies to develop more performant hardware, more user friendly programs and more sophisticated integrated development environments that developers have to install and configure manually on their workstations.

However, installing all software on local workstations impose several limitations on developers:

- the hardware may have unsatisfactory overall performance that is not easy to overcome;
- the software may require incompatible dependencies with other libraries, binaries or software;
- the “works-on-my-device” problem when specific configuration of own workstation may mislead developer in assumptions about other environments;
- the environment may be hard to roll back to a “clear” initial state.

With the extent of cloud technologies, a trend of moving applications to cloud environment has been developed, so called “cloud-native applications”. A newer trend that evolved recent years is the one of substitution of OS-level development environments — binaries, environment variables, third-party libraries, executables and data — with containerized ones.

This potentially makes it possible to overcome the “works-on-my-device” problem, but it also opens a new possibilities to extend the approach to cloud.

In this paper it will be explored how containerization solutions that exist on the market and cloud technologies can be used together to bring new kind of services — cloud development environments (cloud IDEs).

By the end of this paper it will be given answer to the following research questions:

- Can software be developed on devices with just a web browser?
- How can a cloud IDE be designed for scale?
- What are the security measures that should be considered when developing cloud IDE solutions?
- What pricing model is the most suitable for cloud IDEs?

The paper also presents a proof-of-concept of a cloud IDE and its reference design.

The rest of the paper is organised as follows. In chapter 1 it is presented the domain analysis — an introduction for what is cloud, what technologies are already present on the market and what are their advantages and disadvantages. There is described the placement of the problem within cloud domain. In chapter 2 it is presented the design of a cloud IDE platform as well as an in-deep analysis of security considerations and other functional and non-functional requirements. In chapter 3 it is presented a prototype of a cloud IDE and the future work is described.

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