RESEARCH AND DEVELOP THE METHOD OF EVALUATION OF QUALITY OF CLOUD "VIRTUAL WORKPLACE" SERVICE

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Annotation: *Desktop virtualization is a method of emulating user workstations so that they can be accessed from a remote connected device. By abstracting the user's workspace in this way, organizations can allow users to work from virtually anywhere with a network connection. Corporate resources can be accessed from any desktop, laptop, tablet, or smartphone, regardless of the device or operating system used by the remote user. This article discusses virtual worlds as a tool for computerization of the educational process. The development was carried out using the virtual platform OpenSimulator (abbr. OpenSim), which made it possible to add multi-component models of objects of a real workplace - tools, components - to the virtual space.*

Keywords: *e-learning, virtual worlds, training system, workplace, platform, tool, component, method.*

INTRODUCTION

The industry is often faced with the need to recruit new personnel. Often these are young professionals who have just graduated from a university and have hardly any experience with expensive equipment, which creates a side effect in the form of hazardous production factors or the likelihood of failure. It is possible to conduct training with the help of an experienced master, but he needs to pay extra for each student, which is very expensive in the current funding conditions. Therefore, there is a need for virtual simulators that allow you to get an idea of the technological processes at the enterprise and get practice before being admitted to a real workplace.

Used since 1990 in the military and medicine, virtual worlds first caught the attention of the masses in 2003 when Linden Lab launched the famous Second Life virtual world [7].

Remote desktop virtualization is a key component of digital workspaces. Virtual desktop workloads are processed on desktop virtualization servers, which typically run on virtual machines (VMs) hosted either in on-premises data centers or in the public cloud.

Because user devices are primarily a display, keyboard, and mouse, a lost or stolen device poses less of a risk to the organization. All user data and programs are hosted on the desktop virtualization server, not on client devices.

Remote desktop virtualization is typically based on a client-server model, with the organization's chosen operating system and applications running on a server hosted either

in the cloud or in a data center. Under this model, all interactions with users take place on the local devices of their choice, reminiscent of the so-called "simple" terminals that were often used in mainframes and early Unix systems.

MATERIALS AND METHODS

What are the benefits of desktop virtualization?

Resource usage. Since IT resources for desktop virtualization are concentrated in the data center, they are pooled to improve efficiency. Eliminate the need to push OS and application updates to end-user devices, and virtually any desktop, laptop, tablet, or smartphone can be used to access virtualized desktop applications. This allows IT departments to deploy less powerful and expensive client devices, as they are primarily used for I/O only.

Ensuring the work of remote employees. Because all virtual desktops reside on central servers, new user virtual desktops can be provisioned in minutes and new users can access them immediately. In addition, IT support professionals can focus on troubleshooting virtualization servers with little or no attention to which end user device is actually used to access the virtual desktop. Finally, because all applications are delivered to the client device over the network, users can access business applications virtually anywhere that has an Internet connection. If users leave the organization, the resources that were used for their virtual desktops can be returned to the centralized federated infrastructure.

Safety. Year after year, IT professionals cite security as the biggest challenge in their jobs. By eliminating OS and application-related issues on user devices, desktop virtualization provides centralized security control, while hardware protection needs are limited to virtualization servers. The focus is on identity and access management, as well as role-based permissions, which restrict user access to only those applications and data that are authorized for them. In addition, if an employee leaves the organization, there is no need to delete applications and data from user devices. Any data on a user device is, by definition, temporary and is not retained after the end of the user's session on the virtual desktop.

What are the types of desktop virtualization?

The three most popular types of desktop virtualization are Virtual Desktop Infrastructure (VDI), Remote Desktop Services (RDS), and Virtual Desktop as a Service (DaaS).

VDI emulates the familiar model of desktop computing resources in the form of virtual desktop sessions on virtual machines in an on-premises data center or in the cloud. Organizations that use this model manage the desktop virtualization server just like any other application server in an on-premises environment. As all end-user computing environments move from user devices back to the data center, the initial deployment of servers to run VDI sessions can be a significant investment, offset by the elimination of the need to constantly update end-user devices.

RDS is often used when you need to virtualize a limited number of applications rather than a full Windows, Mac, or Linux desktop. In this model, applications are streamed to a local device that runs its own OS. Because only applications are virtualized, RDS systems can achieve higher user density per virtual machine.

As part of the DaaS model, desktop virtualization is provided by service providers. This greatly reduces the burden on IT departments associated with the provision of virtual desktops. Organizations looking to shift IT spending from capital to operating costs will appreciate the predictable monthly costs that DaaS service providers base their business model on.

Comparison of desktop virtualization and server virtualization.

With server virtualization, the server OS and its applications are abstracted from the underlying hardware in the form of a virtual machine using a hypervisor. A single server can run multiple virtual machines, each with its own server OS, applications, and all application dependencies needed to run as if they were running in hardware.

Desktop virtualization abstracts the client software (OS and applications) from a physical thin client that connects to applications and data remotely, typically over the Internet. With this abstraction, users can use an arbitrary number of devices to access virtual desktops. Desktop virtualization can greatly increase an organization's bandwidth requirements, depending on the number of concurrent user connections during peak periods.

Today, virtual worlds are widely used in medicine, where the field for development is very extensive - with the help of virtual programs, young doctors train, team operations are practiced. The European Space Agency is working on an augmented reality system to train astronauts to help and diagnose each other's illnesses in space. The prototype system has been successfully tested at the San Pierre University Hospital in Brussels. [2]

OpenSim is a server platform for creating multiplayer 3D virtual worlds. Users connected to the server are represented as their 3D virtual images – avatars.

Scopes of OpenSim:

- virtual representations of organizations (offices, educational institutions, etc.);
- 3D modeling;
- modeling of physical processes;
- landscape design.

The scripting language is LSL (Linden Scripting Language) developed by Linden Labs. [4] It is acceptable to write scripts in C# [1]: despite the decrease in code readability, this approach allows the use of additional libraries.

RESULTS AND DISCUSSION

Virtual workplaces are implemented in the laboratory. In this regard, the implementation and research of virtual workplaces is underway; this article considers the workplace of an installer as an example. (Fig. 1). ig. 2 shows the structure of the virtual simulator. The client environment renders the space based on the data stored in the

OpenSim database. In turn, OpenSim sends I/O commands to the server, which contains user action history files, desktop state settings, and I/O scripts to the specified files.

Fig.1. General view of the virtual laboratory

At the moment, 3D models of real objects of the workplace have been formed - tools, components, a basic scenario is ready. Particular attention is paid to the processes of compiling learning algorithms. So, two scenarios are designed for the installer: soldering elements and soldering wires.

Soldering of elements includes sub-scenarios for soldering the following radio elements: resistor S2-33N, microcircuit 1533LA3, capacitors K52-1 (electrolytic), K10-17b (ceramic). Each element has its own soldering parameters, such as a seat on the printed circuit board, soldering time and temperature.

An error analysis system is built into each virtual workplace. If the student has made any wrong action, the system tries to return to the previous state, previously signaling the error using text messages (Fig. 3).

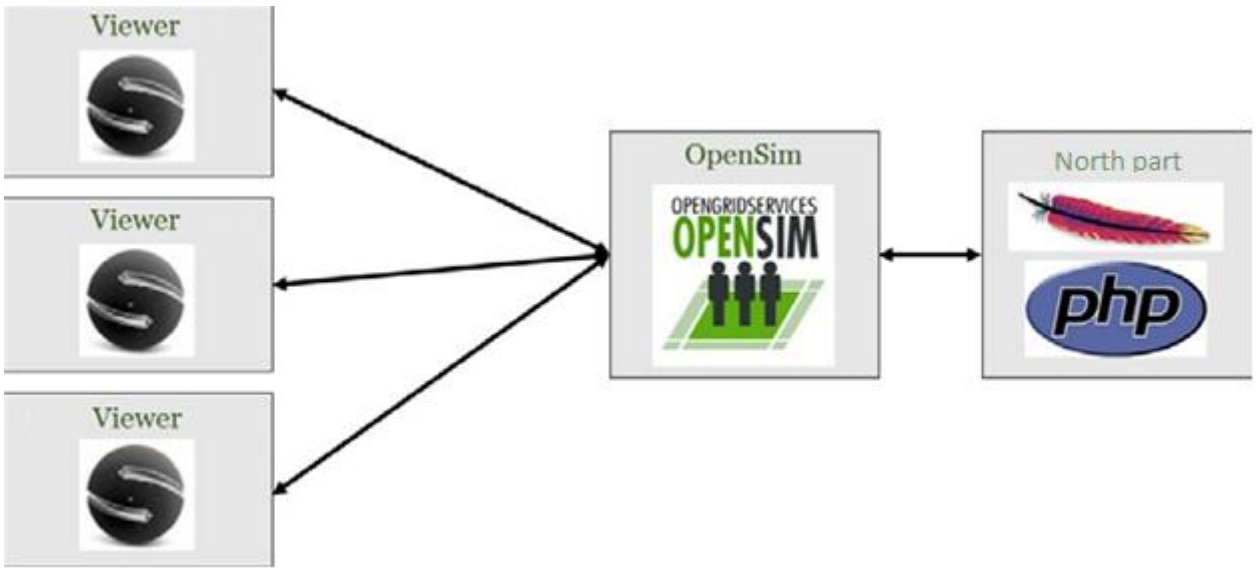
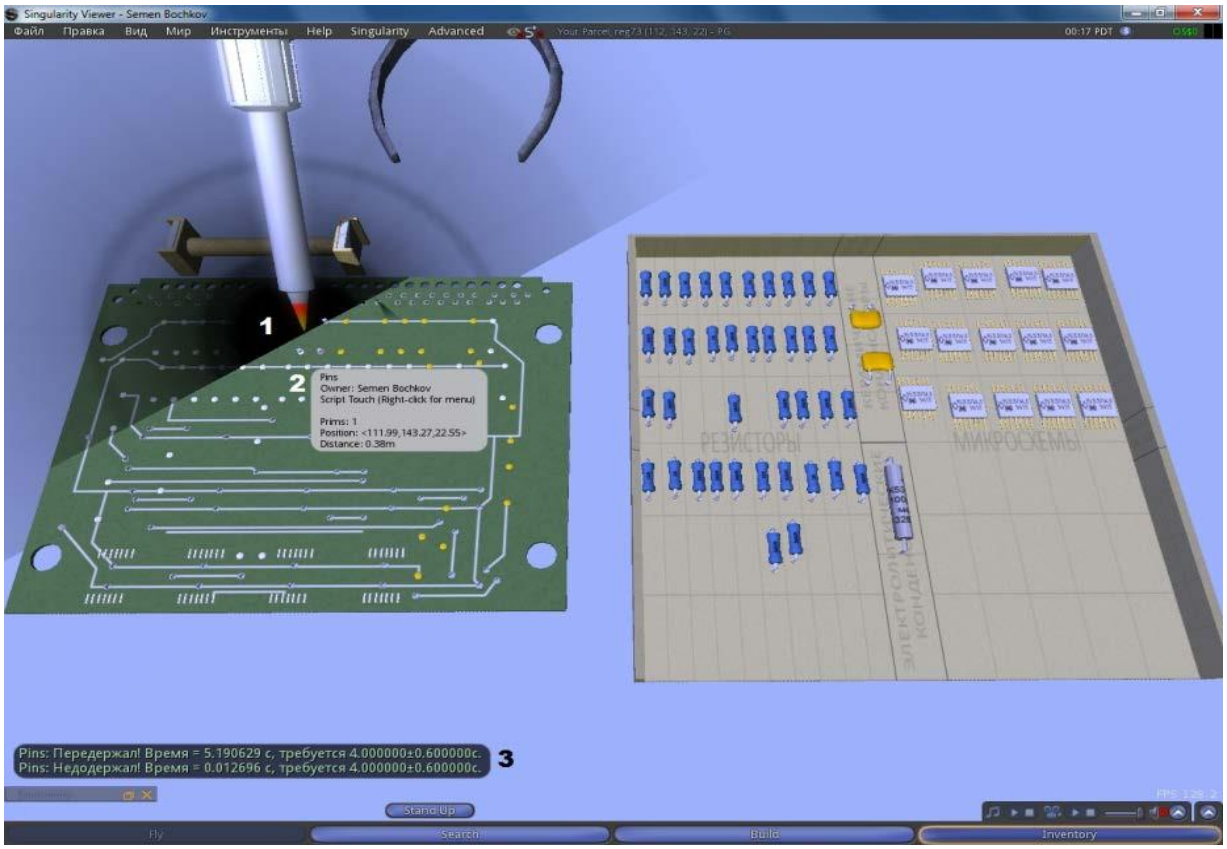


Fig.2. Organization of virtual space.

Thus, in the course of training, the installer must acquire the following knowledge and skills: soldering temperature, soldering time, sequence of actions when installing radio elements such as "microcircuit", "capacitor", stripping and tinning wires, soldering wires.

Fig. 3. Soldering process. For better visibility, the solder on the soldering iron is highlighted in red (1). The mouse cursor is placed on the contact pad, as evidenced by a



pop-up message (2), while the soldering time does not correspond to the required one (3).

Comparison of desktop virtualization and application virtualization.

Application virtualization isolates running programs from the underlying device, while desktop virtualization abstracts the entire virtual desktop—OS and applications—which is then accessible from virtually any client device.

Application virtualization simplifies the installation of each individual application. The application is installed once on the server and then virtualized on the various end user devices on which it runs. A packaged and pre-configured executable is sent to client devices to simplify deployment.

The virtualized application exists as a single instance on the application server, which greatly simplifies its maintenance. Only one instance of the application needs to be updated. If an application is decommissioned, deleting it from the application server will also remove it from all user devices, wherever they may be. Also, since virtualized applications are packaged in their own "containers", they cannot interact with each other

or cause other applications to crash. Finally, since virtualized applications are independent of the underlying device OS, they can be used on any end device, be it a Windows, iOS, or Linux/Android device.

However, virtualization is not suitable for all applications. Applications with high compute and graphics requirements can slow down, causing visible delays during rendering. In addition, you need a reliable broadband connection to provide a user experience that is comparable to using applications on local devices.

The virtual desktop of the user can be represented as a layer cake, as shown in the figure.

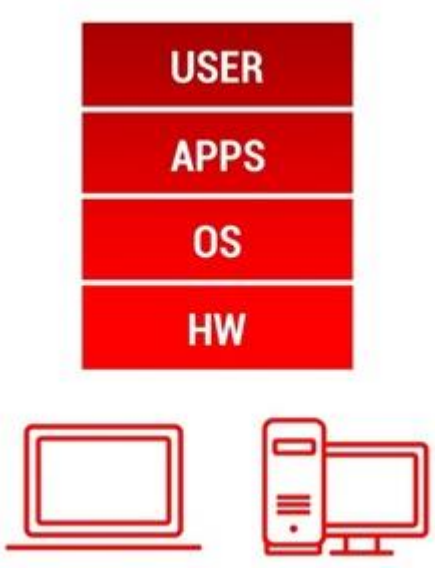


Fig.4. User virtual desktop

As you can see, it consists of four layers: hardware (servers, storage, network), operating system (server or client), applications and user data. All these levels are interconnected.

The approach of ICL Services is to break this whole pie into independent layers. Each time a user logs into the system, that is, on request, the layers will be brought together to form a full-fledged virtual workplace.

Fig.5. complete virtual workspace.

In this way, you can get a number of additional benefits:

- the ability to manage independent life cycles of all components separately;
- longer life cycle of components;
- reducing the complexity of the entire system;
- simplification of management at the level of components;
- increase flexibility and speed of change (quick reaction to changes);

In the classic version, the OS is inextricably linked with the hardware ("iron"). Installing updates, drivers is expensive and carries risks when it comes to tens or hundreds of machines. Because of this, many companies are in no hurry to migrate to newer versions of the OC.

Modern VDI solutions allow you to separate the operating system from the hardware and deliver them on demand. An example is a solution from Citrix - Citrix Provisioning Services. It is enough to create one or several (depending on requirements) golden images (vdisk) and load VDI servers from it. Citrix Provisioning Services will send read traffic over the network, and changes during OS operation will be written to the local cache (HDD or RAM). When you reboot, all changes are reset, and the machine returns to its original state.

Thus, in case of a problem with the OS, it is enough to simply reboot the server, thereby reducing the cost of diagnosing the problem. Updating or switching to a new OS will be done by updating the golden image (vdisk) and then rebooting the machine. There is also a function to return to the previous version of the image in case of any problems.

Citrix Provisioning Services is an ideal example of OS image streaming and is most suitable for Enterprise-level companies, but it is worth noting that there are also simpler solutions in the form of VMware Linked Clones or System Center Configuration Manager (SCCM). These solutions are likely to be of interest to small and medium-sized businesses. One way or another, the choice of the optimal solution should be based on the requirements of the customer, and also take into account the specifics of the company's IT infrastructure and the project budget.

Application virtualization allows you to pack individual applications into so-called packages (packages) and run in their own isolated environment on a VDI machine, thereby increasing the security of the solution. An isolated application is not capable of harming the OS and other applications. In addition, virtualized applications can be updated centrally and provided on demand.

A good example is the well-known App-V, which is part of the Desktop Optimization Pack from Microsoft (MDOP), and in the new Windows 10 it is completely included in the OS kernel. Most companies around the world use this technology, although alternative solutions are now emerging that put applications inside a virtual disk (Citrix AppDisks, VMware AppVolumes). At the moment, they cannot completely replace App-V technology and must work together, complementing each other.

VDI solution should not only increase the mobility and productivity of employees, but also provide a modern workplace that meets all their requirements. If earlier employees adjusted to the requirements of IT systems, now the opposite is true (User Centric IT). First of all, this means that the user must have the same user environment (data and settings) regardless of the OS image and the device from which he connects.

For Western customers, ICL Services has a successful experience in implementing specialized solutions for separating the user environment from the base OS (AppSense, RES) and hybrid profiles (hybrid profile management). These products have a number of advantages:

separating the user environment from the image;

centralized management of user settings;

possibility of rollback;

the ability to apply personalization on demand;

easier control;

Decreased logon time.

As a result, the user gets a familiar working environment regardless of the device or image, and the administrator - simplified management of the user environment.

Standard group policies and roaming profiles are also commonly used in small and medium-sized businesses and provide a basic level of control over the user's environment.

CONCLUSION

Recent studies have shown that among the adult audience, only 4% of people have virtual "I". Today, virtual representative offices of companies on public platforms are more like “ghost towns”, however, “closed” virtual reality platforms continue to be created to address internal needs [7].

The practical result of this project is a system for the formation of skills in the student during the performance of typical work operations.

Promising directions in the field of virtualization are:

• improvement of designed virtual workplaces;

• introduction of an expert system that evaluates user actions;

• integration of the system of virtual workplaces with LMS Moodle;

• development of new areas in the field of science and industry for the application of learning virtualization technologies.

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