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Tittle : Low Fidelity Prototype

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INTRODUCTION

A prototype is a first version of a product from which further versions are created.For example, a simple functional sample, model, model, or just a simulation of a real-world product.The authenticity of a product refers to its intricacies and realism. It relates to the look and feel of your app or website, as well as the content and level of interactivity with your clients.Low-fidelity prototypes are simple physical representations of concepts, use processes, or information structures intended for fast feedback and product improvement. Low-tech implementations are common in these prototypes, which might use paper, cardboard, glue, straws, Lego bricks, and other materials.

On top of that, our project is based on the fourth Industry Revolution (IR4.0) technologies. The fourth Industry Revolution represents a movement towards the goal of intelligent industry and manufacturing. The revolution of industry 4.0 is a digital era from serving users to improving our lives. Self-learning algorithms, autonomous cars, human-machine communication, and big data analytics are all part of IR 4.0, often known as the "digital revolution," which combines technology and human skills in new ways. As a result, it is useful in all human, industrial, and marketing domains. The Internet of Things, Cloud Computing, Big Data and Analytics, System Integration, Simulation, Augmented Reality, and others are examples of Fourth Industry Revolution (IR4.0) technologies. In addition, one of the technologies we chose for our Fourth Industrial Revolution (IR4.0) initiative is virtual reality.

2.Selection of 4th IR Technology and potential Client

The technologies of Fourth Industrial Revolution (IR4.0) we select is Virtual reality. Virtual reality (VR) is a technique that creates artificial habitats using computer technology. In contrast to traditional user interfaces, virtual reality immerses the user in a single experience. Instead of merely looking at the screen in front of them, users may immerse themselves in and interact with the 3D environment. Computers are transformed into gatekeepers of this simulated world by replicating as many senses as possible, including sight, hearing, touch, and even smell. The fundamental limitations of a near-real virtual reality experience are a lack of content and low-cost computing power.

Our project domain is VR Classroom which is 'ClassVR' is a dynamic platform that uses virtual and augmented reality for education and training in settings ranging from the classroom to the boardroom. At all important phases, VR Classroom gives students with a one-of-a-kind, multi-sensory, and totally immersive learning experience. Students can benefit from improved, sensory-based experiential learning by participating in a VR Classroom experience.

2.1 Potential Client

Our clients are the people that came from the education sector like teachers/lecturers and students. For the past few years,as the Covid-19 pandemic has complicated the school session for learning, it also has shown us that our education platform needs to be improved. ClassVR canAllow students to engage in constructivist learning, in which they generate their own knowledge based on relevant experiences. In these types of circumstances, students participate in genuine difficulties, seeking answers and sometimes partnering with others. Besides, The ClassVR also can let the teacher or lectures be more convenient, save time and effectively teach the student in the classroom.

2.2 Problem

Since the pandemic, the students can no longer learn face-to-face with the teacher which makes it harder for the teacher to teach. From the perspective of the current situation, this pandemic is less likely to end soon. Even the latest technologies such as google meet and zoom also can’t contribute much to learning sessions as there are a lot of weaknesses upon it. Therefore there are some problems faced by teachers/lecturers and students.

One of the problems is that traditional ways of teaching or online learning will result in a lack of student involvement. Students cannot feel the presence of their teacher or the same intensity in the classroom, which makes them have no pressure to focus during the class.That is because a prevalent issue in education is that online teaching utilising traditional lecture-based methodologies results in distracted pupils.This lack of participation is regarded to be a major factor to a wide range of bad behaviours that limit student growth, such as dissatisfaction, negative experiences, and dropping out of school.Therefore, students' learning and personal development improve when they are more engaged in academic pursuits.

Furthermore, by excluding the pandemic, the education process still has a problem like a distance between some of the houses of students or teachers and their school still far from each other. They may consume a lot of money, fuel and time just to reach school. The cost is already high just to get to school. Other than that, every year there will be damaged school's furniture such as table, chair, board and the worst one is electronic furniture like fans. This issue has made the student's feel uncomfortable to study because of the unconducive environment. It always took a lot of time to repair or buy new furniture and most likely a year to do it.

On top of that, Teachers and students find it difficult to manage hardware or software such as files, modules, exercises, books and so on. Students and teachers need to bring a bunch of their learning materials like textbooks and notebooks everyday to the class which can be tiresome, especially when there are days with a lot of subjects in the schedule. Beside that, teachers need to check the students' attendance one by one to make sure everyone is attending the class which will consume a lot of time to take all of them. Moreover, teachers also will hardly manage the information or personal details of students. From this the privacy of them is also hard to protect. Therefore, this is more insecure and other strangers or bad people will know and use our privacy to do some Immoral thing.

2.3 Solution

The solution of ClassVR leads to increased student engagement is VR has a number of features that can help to increase student engagement.The ClassVR have through the platform layer. This layer contains applications, runtimes, middleware, containers, rendering, perception, and coding/decoding, and it provides students with a new approach to learning as a compelling hands-on, engaging, immersive activity in which students are exposed to new experiences they have never encountered before. Google Expeditions, for example, enables professors to take students on virtual field trips to Mars, the bottom of the ocean, and a number of other locales, which may increase students' interest in the subject, create a shared experience for greater classroom debate, and enhance overall engagement. This type of unique and innovative learning opportunity entices and stimulates children's attention as they actively study and develop their curiosity. This enhanced involvement may be used to address topics that are generally uninteresting or low in interest of students. Besides, it also can provide an experience where students can feel like they study face-to-face at class when in reality they study online at home. This will help the students to become more focused in class while teachers are teaching. The intense environment in the VR classroom will help the students to avoid lost concentration during the online class session.

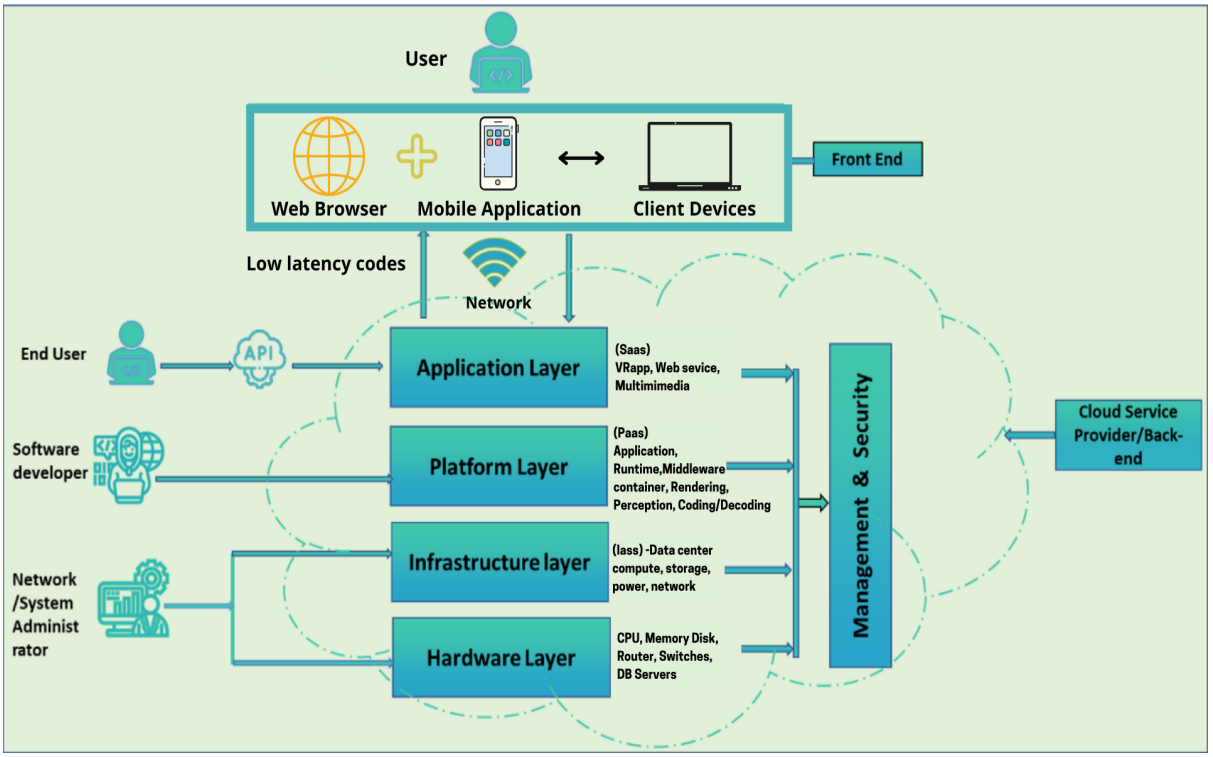
Furthermore, ClassVR can reduce cost for students to study as they don't need to consume fuel and time to go to school, except for sports or co-curricular activities. That is because the ClassVR provides the virtual reality environment. The teachers or students just need to use the client devices to connect the ClassVR app and 5G network connection with low latency, high capacity and guaranteed throughput, so they can study online at home and can access the resources of the cloud. Besides, the ClassVR also provides the virtual classroom so they no need to worry about the uncomfortable environment to study. This will help students to avoid having unnecessary stress that will interrupt their study. Apart from that, in settings when repeated practice and a safe environment to fail are provided, VR also

allows for free training, experimentation, or simulation.Therefore, the school or teacher can save the money and the teacher no need to worry about the student being injured when doing the experiment. The virtual environment empowers and engages students by allowing them to govern their learning in a consequence-free, exploratory manner.

Apart from that, ClassVR can manage and provide security and privacy.That is because on the IaaS platform,Storage units (CPU, Motherboard, Graphics Processing Unit) are included in this tier (GPU). It can store and manage data such as files, movies, documents, and so on through the internet. From this the teachers can record the information and personal details of students in the ClassVR,teachers and students also can find, upload and store the class module and exercises in the ClassVR.ClassVR also have management to record the attendance of students and teachers when they are use the ClassVR or in online.The privacy of students and teachers also can protect because ClassVR have security like virtual firewalls to prevent the data loss.

3. Architecture planning and design

The cloud VR architecture is depicted in the image below. Cloud Edge handles the processing parts of the VR experience, while the visual experience is supplied to the user's end over a 5G network connection with low latency, high capacity, and assured throughput. The same 5G network connection also sends sensor input signals from the terminal to the application for processing.



3.1 Introduction of Cloud Computing Architecture

A cloud computing architecture is the set of components necessary for a cloud computing service. The ability to use the cloud to store large amounts of various data and applications and provide them on demand, as well as the use of the Internet for storage applications such as email, as well as seamless access to powerful hardware, servers, storage, and software technologies, are all examples of cloud computing architecture. Aside from that,Front-end platforms, back-end platforms or servers, network or Internet services, and cloud-based delivery services are also part of cloud computing architecture.

3.2 Network

Network is links the front and back ends. Furthermore, cloud resources are available to all users. It assists users in connecting to networks, establishing routes, and establishing protocols. It is a cloud computing platform-hosted virtual server. It is very adaptable, secure, and affordable.

3.3 Components of Front-End Cloud Architecture

The client is the front-end of a cloud computing system. The front end is what the user sees and interacts with (user interface). This approach enables us to comprehend how cloud computing resources may be distributed via the front end. It is the visual interface of the client, client, and user, as well as the device used to contact the cloud environment's client support network. The front-end architecture is broken down into three parts.

Web Browser: A web browser is software that enables individuals to access and explore information on the Internet. It enables cloud computing software to run a virtual reality classroom using a user terminal that looks like a browser or client programme.

Mobile Application:A mobile app, also known as a computer programme or software application that runs on a mobile device such as a phone, tablet, or watch, is a computer programme or software application that runs on a mobile device such as a phone, tablet, or watch. Because of the input devices and internet connections, a user may directly engage with the cloud via the user interface of the app on mobile, and it can do computing on the cloud.

Client Devices: Client devices refer to the hardware at the end user side. It can be any end user device such as a VR headset, laptops, smartphones, and desktop computers are considered to be 'clients' of the servers. Furthermore, this is how the majority of IT workers connect with one another and with clouds.The client device sends a web page or application request to the server, and the server provides the response.

3.4 Components of Back-End Cloud Architecture

The cloud is referred to as the back end. The back-end is a portion of the programme that is not visible to the user. It has all of the resources required to provide cloud computing services. Cloud service providers oversee the back-end architecture of cloud computing, which is based on distant servers. They usually have four levels, beginning with applications, platforms, infrastructure, and hardware and concluding with security and management software.

Application Layer:A fundamental component of cloud computing architecture is the application layer, sometimes known as software as a service. Any SaaS-enabled software programme or Web service that handles customer requests and needs might fall under this category.The application layer is a distribution model in which third-party programmes are hosted on the Internet and made available to users.

Platform Layer: This layer provides the PaaS platform for cloud-based VR adoption is critical because it must deliver the required capabilities to the application layer, as specified in the VR requirements section.This layer has applications, runtime, middleware, containers, rendering, awareness, encoding/decoding. Application use cases Applications require robust processing to achieve the highest possible resolution. The service runs at runtime. Virtualization software is used to generate runtimes, which are generally referred to as Hypervisors. Middleware is the service-oriented system architecture of the cloud computing platform and connects the computer or other devices to other applications. Container is a package of software that contains all of the necessary elements to run in any environment. Rendering allows users to send a local file to a cloud server, after which a remote computer cluster completes the rendering. And give the real perception such as sound, visual sense to the user. After that, the coding and decoding are transmitted to display image correction.

Infrastructure Layer: This layer has compute, storage, power and network. On the IaaS platform, at the host application and network tiers, storage devices (cpus, motherboards, and graphics processing units (Gpus)), virtual machines, virtualization software, and servers that offer entire cloud software services also are all included in this layer. It uses the internet to store and preserve data like files, movies, and documents.When needed,this scalable storage and computing capabilities can be used by System Administrators. From this the students' information, class module and exercise can be uploaded and stored in the VR app.

Hardware Layer: To modify hardware settings, high availability, power, and network administration, this is the lowest layer in the cloud architecture, and it basically comprises all the pieces that can be physically maintained, such as database servers, routers, switches, and in-memory discs.

Management: Its task is to commit specific resources to specific activities while completing a huge number of cloud-related processes. It assists in the administration of apps, tasks, services, security, data storage, and cloud infrastructure components. To put it simply, it establishes coordination among cloud resources. This demonstrates that the VR classroom seems clean and fluid.

Security: Security is a critical component of back-end cloud architecture. End users' cloud resources, systems, information, and infrastructure must be secure. It also provides cloud server security control via virtual firewalls to avoid data loss. From this it can protect the information and privacy of students when using the VR classroom.

This architecture planning and design is suitable for our project prototype because it provides the complete and appropriate cloud service.

4. CONCLUSION

Virtual reality has seen a tremendous technical revolution since 2012. As headsets have become smaller, more portable, and more powerful, the technology has become significantly more accessible. Furthermore, 5G phones have made it possible to connect to the virtual world from everywhere. Because of its increased accessibility, virtual reality has become a feasible option for schools. Thanks to 360-degree cameras and creative initiatives like Google Expeditions, VR has infiltrated the classroom, allowing instructors and students to approach education in ways they never have before. Virtual reality in the classroom is likely to soar in the coming years.

Organizations may securely construct applications and utilize cloud services based on consumer needs owing to cloud computing architecture. Workplace flexibility, remote access to data over the web, team collaboration, data processing, digital tools, increased security, and catastrophe management make cloud computing the most popular and recommended technology among users. This technology also allows for a wide range of entertainment options. There are several courses available for understanding cloud computing and gaining in-depth expertise.

4.1 Achievement

Today's virtual technologies assist pupils in learning in a practical setting. This implies that students from all around the world may work together to develop answers using virtual reality. Many universities from diverse countries are collaborating to build a more inclusive campus. When compared to students who depended on standard computer programs, students who used immersive virtual reality were able to complete tasks faster.

Cloud Architecture refers to the many components in terms of databases, software capabilities, apps, and so on that are designed to harness the power of cloud resources to meet business concerns.Cloud architecture defines the components and their interactions. The majority of the responsibilities for system control, infrastructure management, and security will be transferred to the service provider with cloud computing. To ensure efficient resource utilization and overall predictive planning, the cloud provider monitors and regulates various components of the cloud service.

4.2 Limitation

One of the most serious difficulties that virtual reality has in education is a lack of material. The truth is that generating new material may be quite expensive, and not every educational institution has the financial means to hire a software development business to help them with this task. Moreover, a large amount of effort is required to create a virtual environment with multiple test scenarios and specifications. Virtual reality is usually restricted in scope or has a paucity of ready-to-use teaching scenarios. On the other hand, while many students can afford to acquire a virtual reality headset, there are still some students who cannot. They are unable to benefit from VR-based learning as a result of this situation.

We entrusted our information to a third party. We are confident in terms of security, privacy, confidentiality, and data backup. A cloud architecture is a platform that anyone with authorization can use. However, cloud architecture has some security risks, as we all know, as hacking technology advances. This has to be double-checked.

4.3 Contribution

By generating a social presence within a social setting, VR classrooms overcome distance obstacles and encourage participatory culture. Because learning is a social process, virtual learning can be just as effective as traditional learning if there is a high level of student-to-student interaction. Students have the potential to become creators, active explorers, rather than merely passive virtual reality consumers. They can contribute their own ideas to the virtual environment, building their own fictional realm that others can explore with the use of immersive technology.

We've become so accustomed to cloud architecture that we've forgotten what it entails. Many of us can recall aspects such as on-demand resources, optimal performance, and service delivery. Enabling developers, operators, and other users to access the cloud resources they need when they need them across the company with minimal friction is a common starting point for developers. Creating and maintaining optimal resource capacity and availability at a cost that is reasonable. From infrastructure to software to people, resource and capacity management encompasses all layers.

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