International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 05 May 2024, pp: 87-91 www.ijaem.net ISSN: 2395-5252

Online Training Platform for Computer Network Courses

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Date of Submission: 01-05-2024 Date of Acceptance: 08-05-2024

ABSTRACT: Online learning is not only self-study, but also a training system integrating teachers, learners as well as resources. They are all needed for effectively delivering a course through online training. Especially, for computer networking courses, it needs the accessibility of practical experience, communicating response as well as timely information for understanding intricate intellectual skills. It needs platforms where they can form training systems and offer distant access to online topologies employing real network tools. The current article indicated the needs for such a platform grounded on the existing knowledge. Next, it looks at some current solutions as well as determine which platform is suitable to organizational desires.

KEYWORDS: Online training, Practical experience, Distant network laboratory.

I. INTRODUCTION

Bests in numerous areas have been supposed to be affected by the distinctive ability for successes (Bowman, 1996). Nevertheless, later academics show the association between innate capabilities and job effectiveness is revealed low, at least in the scientific and technological fields (Baird, 1985). In contrast, practice allows learners to obtain expertise in courses (Gobet & Campitelli, 2007). Practice is not only regarded as one of the main elements as well as methods for training, but also deemed by a few scholars as a needed condition to obtain expertise (Gobet & Campitelli, 2007), whereas others regard it as a needed and satisfactory condition to master experience (Ericsson et al., 1993; Montero, 2019).

With practice, one could improve problem solving skills to novel and intricate conditions (Roediger, 2013). Simultaneously, via practice, intellectual improvements could offer incentive for further learning (Kalchman et al., 2013). Deliberate practice as well as the structure of teaching is vital for attaining excellence (Ericsson et al., 1993; Gobet & Campitelli, 2007; Nikolaidis & Knechtle, 2018). In science training, practical experience is the focus of the training process (Nersessian, 1989).

According to Leidig and Cassel (2020), the curricula offer procedures and commendations for undergraduate courses in computer. It intensely suggests practical experiment as the training experience should strengthen learners' understanding of conceptions and the usage to actual situations.

The training of computing network courses of information technology is different than the training of other information technology courses where not only concepts are to be educated and understood, learners must master numerous explicit instructions, restrictions and formations. Another vital difference is that learners are regularly expected to attain a satisfactory degree of proficiency and may be able to adapt, arrange, as well as debug working networks after finishing training courses. It is supposed not to make mistakes as slowdown is not an option. Mistakes that occur may be expensive and harmful to the working network. It makes practical experience a vital part of the training course. Thoughtful practice that repeats the practical experiment can make training more efficient.

Training computer network programs via online training causes other challenges. Online training is defined as not just self-study, but it is necessary to establish a training system that is made up of learners, teachers and instructional resources consisting of practical experiment and thoughtful practice on request (Traxler, 2018).

The current article presents the process of choosing and connecting platforms for online training that could facilitate the establishing of training systems as well as offers practical experience; and thoughtful practice for efficient education and training of computing network courses. Next, it reviews the literatureand establish the requirements of online training platforms for computer network courses. It will then assess current platforms. Subsequently, it is going to analyze the structures and matters concerning the selected feasible platform. The last part will summarise some conclusions for the research.

II. NEEDS FOR ONLINE PLATFORM

Network technology has been becoming a vital educational instrument (Leidig & Cassel, 2020; Webb et al., 2017). Demand for netcentric specialists is regularly growing. It allows the training and education of computer network courses improved its importance. Online training is a characteristic training method which depends on network technology. The training of computing network courses via distance training has more importance than theoretical courses; because it is an usage of what have been taught.

One of the encounters for training computing network courses is to offer practical experiments, education experience to learners that don't physically access a conventional computing network laboratory. The second encounter is that we need to establish a training system.

To study computing network courses in an online training method successfully, it needs to have a platform where it can establish training systems that consist of teachers, learners and resources (Traxler, 2018).

Resources for a training system is made up of instructional materials, practical activities, and prompt response. Practical activities are entered into the resources because they are significant to science learning (Nersessian, 1989) as well as similarly significant if not more, in the computing network field (DiCerbo, 2009).

Providing practical experience to learners through distant access may be a dilemma. Nevertheless, practical laboratories are becoming progressively intervened because it depends more and more on computing for automatic data gathering as well as monitoring (Mann et al., 2018).

Computing network lab conditions have incorporated practical and computing-mediated instruments to a degree which practical and distant lab experiences are fairly similar for a learner. Real-object practical as well as distant practical experiments are not different than physical associates of tools as well as cabling that are a few aspects that online access can not be reached.

Operative practice is cautious, so it needs a platform that allows, not only practical experiment, but also thoughtful practice on the experiment to be wanted (Gobet & Campitelli, 2007). As single learners have different commitments, thoughtful practice requires to be supple and schedulable by learners to match with their regular routine.

Replication is a brilliant education and training instrument (Goldstein et al., 2005). When appropriately applied, it can involve learners in active education of computing network courses (Hendrickson, 2021) and facilitate deep education rather than just surface education (Biggs et al., 2022). However, it is limited by the feature sets from the real tool being employed and can not replace practical experiment that employs actual network tools.

Prompt response is one of the sound practices in university training (Chickering & GamsonMarch, 1987). Coupled with timely information demonstration, the influence of practice could be importantly improved (Kester et al., 2001; Linneman & Plake, 2006). Consequently the resources for a training system should consist of prompt response as well as timely information.

It is worth stating that the practical experiment is completed in a separated laboratory environment with no interrelating to the working network. Learners as well as teachers may be able to run the way for the solution of a frank issues without being stressed to keep systems running without any interruption (Hill et al., 2001).

III. CURRENT SOLUTIONS

TinkerNet is a cheap network laboratory platform. Personal computers running a altered version of OSK that was developed and distributed by the Flux Group in the Utah University and are connected together to create two single local area networks. One of them brings all the learner test traffic and the other brings the TinkerNet management traffic (Erlinger et al., 2004; Winters et al., 2006). The chief focus of TinkerNet is the application and process of protocols. It can be helpful for the education and training of system management as recommended in a study by Winters et al. (2006). However, OSKit is no longer retained by the Flux Group in the Utah University.

Virtual laboratory has been developed by computing network laboratory (Jakab et al., 2009). It is made up of two parts, hardware and software. The hardware part is composed of personal computers, networking tools, a console port switch and a power switch. The console port switch offers access to support ports of all networking tools as well as the power switch, which could be configured via its support port to lead power to a certain networking tools and therefore turning the tool on/off. The unique virtual laboratory offers support access to networking tools. It is outstanding for training the software configuration of the networking tools. The Edinet-enabled version consists of virtual personal computing access. Nevertheless, both the unique and the Edinet-enabled versions do not clearly integrate physical links between networking tools that make the establishment of networking topologies not achievable (Jakab et al., 2009).

Distant access laboratory for internetwork training is demonstrated by using an access server to offer internet interface to distant users (Makasiranondh et al., 2011). The networking tools are interrelated as in an actual network and a linkage from one of the networking tools is associated with the access server to allow internet access to the networking system. The arrangement is better than virtual laboratory as it could establish networking topologies rather than investigating single tools alone. Nevertheless, distant access laboratory does not consist of the usage of personal computers, virtual or not, that makes some networking concepts, such as switch port security, hard to understand. It doesn't utilize power switches as in virtual laboratory. It makes some of the features of networking tools, such as router password recovery, not accessible. Some of the abovementioned distant practical solutions allow team participation, but none of them lead to clear instructor presence as well as possible response. Additionally, arranging experiments appears to be a problem, not yet solved.

IV. SELECTED PLATFORM

The platform it has selected is NETLABAE, which is a server appliance with all the software implements preloaded for educational organizations to host actual lab equipment, virtual machines as well as Cisco computing networking laboratory contents for distant laboratory access. It also leads us to establish NETLAB systems and training teams that is vital for effective online training. The subsequent are the main points that are regarded when choosing this platform.

Training systems: NETLABAE leads us to combine learners into NETLAB systems based on certain criteria, for example, the time zones where learners reside. Learners from diverse parts of the world within a NETLAB system could plan laboratory sessions in the respective daytime or in the suitable timing for attainment of laboratory experience. Within each NETLAB system, learners could be randomly assigned to groups. Each group is a training system of its own. Within the group, learners could interrelate and share the laboratory experience in actual time with other members of the same group.

Resources: The cisco training and the training materials given with the system evidently indicates the objectives of each computing network experiment. It will allow us to align the training results usefully with the SOLO taxonomy (Brabrand & Dahl, 2008). The mentors could offer actual support to the learners by taking control of an active learner laboratory session. Mentors could also offer timely information to facilitate the acquisition of intricate intellectual skills in computing networking courses by learners (Kester et al., 2001). Teachers could employ the detailed activity log to check the progress of learners or utilize the log for summative assessment. The system supports Multipurpose Academy POD that could be applied to accommodate numerous networking topologies vigorously. Hardware could now be applied more proficiently and successfully to attain desired training and education results. Switched power outlets let learners power on/off networking tools remotely and make some features of networking tools, such as router password recovery accessible. The platform supplies the system default configurations and makes the default factory configurations always available.

Installation: It is humble and conventional advancing. The only thing is to pay attention for the rude characters utilized in the storing access path for VMWare ESXi Server. The server generates virtual machineries as hosts in diverse networking topologies employed by the platform. Roughly 150 manhours are needed to finish the installation procedure.

*Problems with the selection: The system utilizes VMWareESXi Server to virtualize host procedures. Rude characters are applied in the assess path of the internal storage tool. It can only copy and paste the path rather than typing the path manually. As the communicating graphical user interface of the networking topologies needs fairly high data rate, high speed internet linking is desired. When the NETLABAE server is left sedentary for a period of more than seven days the server indeterminately runs into a frozen condition and it cannot be mended fixed only by substantially resuming the server. If a team of learners has ended a lab session before the arranged time period, the hardware resources allocated for the specific time session is not available to any operator until the session reserved becomes finished.

V. CONCLUSION

The vital component of success in online training is to involve learners in training systems. Communication between learners and teachers is a vital factor of success for a training system.

Training would be more effective when instruction material and response are both timely. Moreover, a flexible laboratory session scheduling would allow learners from diverse parts of the world to join a training system in spite of their locality and time zone. Learners can also schedule thoughtful practice based on their needs and at their own convenience.

Having investigated numerous current solutions, it determines that NETLABAE is a suitable candidate for the online training platform.The platform applies actual networking tools for actual networking topologies rather than simple console access of networking tools. With automatic power on/off utilizing power switches, learners could discover special tool features like password recovery.

During a distant laboratory session communicating replies from the teachers as well as members of the same training system make the procurement of knowledge more operative. The simple installation process makes it a feasible platform for computing network courses via online training.

It can add NETLABAE to the current online training platform as well as compare the change of effectiveness in training and schooling of computing networking courses after the outline of the selected platform.

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