Context-Awareness on Mobile Learning Virtual Private Network

Areerat Songsakulwattana [1] and Surachai Deyhing [2]

[1] Computer Science Department, School of Digital Innovation and Information Technology, Rangsit University, areerat.s@rsu.ac.th

[2] Computer Science Department, School of Digital Innovation and Information Technology, Rangsit University, surachai.d@rsu.ac.th

---

ABSTRACT

Currently, the mobile learning concepts about delivering context over wireless network environment had involving and more important in human life. There are several benefits such as low-cost mobile environment, access anywhere and anytime, which lead us to change the learnig way. The traditional in-class teaching approach were shift to adaptive learning paradigm, mobile devices are the key pin to lead mobile-context to human. The teaching and learning services are served by conveying and exploiting individual adaptive interest context, so-called context-awareness on mobile learning over wireless environment. This study propose the model of context-awareness on Mobile Learning Virtual Private network in term of real-time messaging which introduce the architecture of the model to improve congestion load and reduce response latency due to diversity learning-context needed. The mobile learning architecture consisting of the front-end module, the learning hub module and back-end module including caching module to keep adaptive cached-context for balancing load congestion in mobile network environment. These 3 modules including mobile devices in wireless network environment and context-awareness applications to co-operate with underline context management system on mobile virtual private network.

Keywords: Real-Time messaging, Learning context, Context-Awareness on Mobile Learning, Virtual Private Network, Cached-Context.

1. Introduction

The learning environment is not limited only on formal location as classroom, laboratory but also on anytime anyplace via learning instrument and tools such as smart phone which boarding content (text, graphic, audio, and video information) through mobile environment and using virtual private network. The learning context should be conveyed to learners in group or individual under dynamical transmission situation with context-awareness supported theme.

I-Hsueh Tsai (2005) study and present the model of course development for mobile learning context. They proposed preliminary study and simulated some course for preliminary school by integrate mobile network, course curriculum and teaching strategies. Now a day, the mobile environment become populated and expand many services and capability due to complex infrastructure of mobile network including more standard and protocol.

Jeff (Jeff J. S. Huang, 2010) analyze similar interest and build up a collaborative service mechanism to support Mobile Computer-Supported Collaborative Learning activities (MCSCL). The study aim to build up learner-oriented mobile learning knowledge network which learners that have same interest by recommending partners with specialties service for learning group.

Sergio Gómez (2014) aimed to address the delivering process for knowledge context on mobile network environment via mobile devices. They propose a mobile system for delivering context-aware pedagogical to adapt the learning flow of education scenario, as well as knowledge context stuff and the delivery tool and services support.

As several study above, the author do study on how to manage knowledge context delivery processes with low congestion load balance and yield good response latency on mobile network with suitable knowledge resource under optimum experience. We also focus on combining MVPN (Dash, 2008) and Context caching into our study scope and propose the model of Context-Awareness on Mobile Learning Virtual Private Network.

2. Objectives of the study

Currently, people use mobile devices to do several online activities such as entertainment, shopping, online banking, search some information and also learning some knowledge. The new era of learning paradigm had been shifted from traditional in-class to be online learning and popular in mobile activities lead us to focus and study the mobile learning strategies to shape and exploit the framework based on model, architecture to improve performance services on conveying learning context to mobile users or learners.

By the way, some study focus on content management, but due to diversity context need for many learners, the balancing load congestion and efficiency service still be concerning point for collaborative service on mobile learning network. Mobile virtual private network and context caching also should be include into underline architecture to balance the load and stay improve performance between knowledge transferring on over mobile learning network.

3. Background

The context awareness mobile network model on virtual private network environment are attracting people and simply use to convey knowledge context to learners in current society. Several research study are focus in many perspectives. This paper review, and present main potential knowledge points and glue the overall connection of mobile learning paradigm. The most propose strategy of our study remain in exploit the proposed model with optimum performance service, reduce load congestion and increase response latency. The description of subsequence knowledge background are as following topic below.

3.1 A Context-awareness on Mobile Learning Environment Architecture

This section presents a context-awareness on Mobile environment architecture to convey learning context to distributed learners as part of learning contact group who can seeks learning content anywhere and anytime. The architecture consists of three modules as shown in

Figure 1.

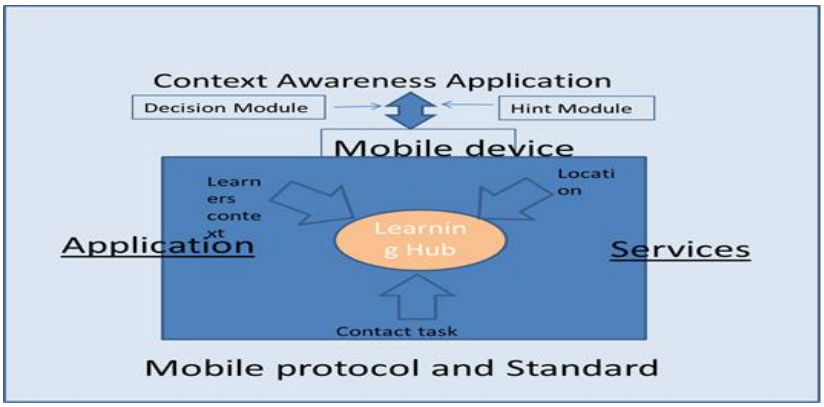

Figure 1: Architecture of context-awareness mobile learning model

- The Front-end module receives a request and then starts finding the requested (web) object in the learning hub. If the requested (learning content) object exists in the learning hub, it will be presented promptly as the response towards the request. If the object does not exist in the proxy, it will be transferred from the Internet and then kept in the proxy space. Every request is recorded in the access log for further analysis. When the system tries to cache a new object in the cache space but there is no space left, the replacement mechanism will be triggered. The replacement policy can be various.
- The Learning module takes the history from the access log to learn a set of replacement rules to determine which object should be replaced first.
- The Back-end so called Prediction module predicts the most suitable objects of knowledge context in a cache space to be kept and delivery by using information of learner requests from past history together with caching policy management.

The three modules cooperate together to manage knowledge cache server by managing the policy to utilize cached context and deciding which objects would be evicted or kept. Cache servers of service provider also keep knowledge context to mobile learners with efficiency services and customizing load balance on mobile network environment.

3.2 Context Awareness Mobile Learning Concepts

The context awareness mobile network model on virtual private network environment present both concepts and architecture for learning society. Academic society can adapt and develop learning theme of themselves by combining such proposed model to increase potential of conveying knowledge or any information to all learners by group or individual. Learners can study and seek study material stuff at anyplace, and anytime under dynamical environment change. In this paper, the learner or group of learners can use mobile devices to contact the learning hub to seek the knowledge. The contact occurrence are corporate between context services provider and mobile learners. Criteria of contacting task depending on location based connection occurrence such as in residence, in classroom, in laboratory or outside. The learning hub can be either from learning distributer or from sibling learners who situate nearby the learners and reach the context before. The process to convey context to learners using both push and pull strategies. The provision context awareness task stand for the purpose of location and conditional environment change distribution scale via mobile network using virtual private network.

3.3 Mobile Virtual Private Network

A mobile virtual private network (mobile VPN or mVPN) provides connectivity to mobile devices that access software applications and network resources on home networks through other wired or wireless networks. The networks these devices connect from can be either secure or insecure. Mobile VPNs are widely used in situations where workers are required to keep sessions open at all times (Dash, 2008).

Mobile VPNs have the following features:

- Application Compatibility: Software applications that run on a wired LAN environment also run over mVPN without the need for any modification.
- Roaming: The connection remains intact as changing networks handle logins automatically.
- Persistence: Applications left open are active and available even when the wireless connection is interrupted.
- Security: Authentication of users and devices is enforced along with data encryption of data traffic as per security standards such as FIPS 140-2.
- Authentication: Two-factor or multifactor authentications are enforced using combinations of password, public key certificate and biometrics.
- Acceleration: Data compression and link optimization improves performance over wireless networks. mVPNs are used in home care, hospital settings, public safety, utilities and field service management.

3.4 Context Caching

A web cache (or HTTP cache) is temporary storage (caching) of web documents on web server, such as image and HTML pages, to reduce load congestion over network and improve response latency. A web cache system will keep duplicated request documents to cache server which pass from original web or object server;

subsequent requests may be satisfied from the cache if certain conditions are met instead of go through the network rout to the original server. A web cache system consisting of hardware and software of managing cache context under policy management.

In the study of context-awareness mobile learning model over MVPN, caching context on cache server can improve response latency and reduce congestion network. The proposed architecture, authors also focus on caching knowledge context on cache server on backend module to support request contexts to mobile learners over MVPN to keep good performance services.

4. Conclusion and future study

In the work, we proposed the learning-based paradigm via mobile virtual private network environment so called Context-Awareness on Mobile Learning virtual private network model, the method to select knowledge context deliver to mobile learners and manage knowledge resources on the cache to be retained or evict before contact knowledge service providers directly. The learning-based model is the concept of how mobile learners can be do online learning from anyplace and anytime with efficient service. The hidden aspect of learner request pattern are kept in the history log to be underline information for service provider to select knowledge context covey to remote learners with several situations. As our future work, we will study the application of LBR on prefetching in dynamic environment for a self-tuned mechanism for MVPN. Future work, the authors will focus on simulation environment with a course curriculum on mobile network environment over MVPN and cache management concepts. Based on the proposed model, performance evaluation will be investigated and discuss to improve and develop more services supports.

References

Alzaabi, M. J. (2010). Web-based Architecture for Mobile Learning. *International Journal for Infonomic*, 207-216.

Dash, A. K. (2008). *Next-Generation MPLS MVPN*. SANOG: Juniper Networks, Inc. .

I-Hsueh Tsai, S. S.-C.-H. (2005). Exploring the course development model for the mobile learning context: A preliminary study. *Proceedings of the Fifth IEEE International Conference on Advanced Learning Technologies* (ICALT'05).

Jeff J. S. Huang, S. J.-M. (2010). *Social Learning Networks: Build Mobile Learning Networks Based on Collaborative Services*. Educational Technology & Society, 78-92.

Sergio Gómez, P. Z. (2014). Context-aware adaptive and personalized mobile learning delivery supported by UoLmP. *Journal of King Saud University* - Computer and Information Sciences, 47-65.