

## A Web Synchronization Agent based on a Home M2M Network

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**Abstract.** This paper presents the design of a web synchronization agent for collaborative multimedia distance system which is running on Home M2M (Machine to Machine) Network for ubiquitous networks. Home M2M Network provides standardized communication protocols to interoperate an application with others under dynamically changing situations. Our proposed model is to present the relationship of resources for web synchronization based on Home M2M Network architecture.

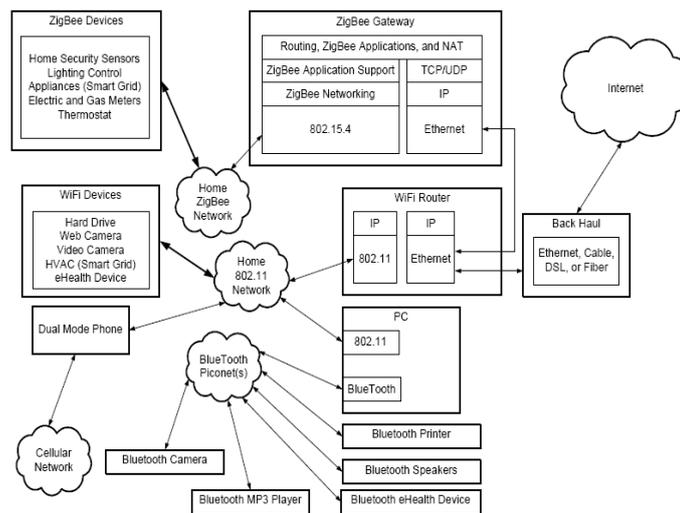
### 1 Introduction

Distributed multimedia holds the promise of greatly improving all forms of remote education and training [1]. Distance education is planned learning that normally occurs in a difference place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements. It presents a general systems model that describes the main component processes and elements of a distance education institution, program, unit, consortium, or course [2]. The development of middleware is closely related to the evolution of ubiquitous computing began in the mid of 1970s, when the PC first brought computers closer people. With the advent of networking, personal computing evolved into distributed computing. With seamless access and World Wide Web, distributed computing marked a next step toward pervasive computing, and mobile computing emerged from the integration of cellular technology with the Web. The “anytime anywhere” goal of mobile computing is essentially a reactive approach to information access, and it prepare the way for pervasive computing’s proactive “all the time everywhere” goal[3,4]. Context awareness(or context sensitivity) is an application software system’s ability to sense and analyze context from various sources; it lets application software take different actions adaptively in different contexts[5]. In a ubiquitous computing environment, *computing anytime, anywhere, any devices*, the concept of situation-aware middleware has played very important roles in matching user needs with available computing resources in transparent

manner in dynamic environments [6]. Thus, there is a great need for synchronization control algorithm in situation-aware middleware such as Home M2M Network for web synchronization to provide dependable services in ubiquitous computing. The system for a web based multimedia distance system includes several features such as audio, video, whiteboard, etc, running on situation-aware middleware for internet environment which is able to share HTML format. Our proposed model is to present the relationship of resources based on Home M2M Network for web synchronization.

## 2 Related Works: Home M2M Network

Fig. 1 illustrates a home M2M network that can be built with products that are commercially available today. In Fig. 1, three local networks (802.15.4 (ZigBee), 802.11 (Wi-Fi), Bluetooth) tie into a common backhaul. The ability to control home security, HVAC, lighting, appliances, and entertainment systems remotely or from within the home is certainly attractive to the homeowner [7].

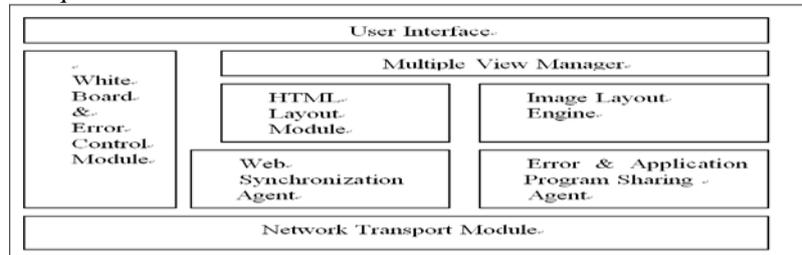


**Fig.1.** A System Architecture of a Home M2M Network [7]

An integrated M2M gateway could provide convenient web-based management for the home network [7,8]; it could be a single point of contact that the homeowner can use to manage the entire network. The fact that there are many different physical communication links in the network would be transparent to the homeowner. The always connected, always powered gateway could query and collect data from the network at the most efficient times, and the homeowner could examine or control the network status by logging onto the gateway. The homeowner would not be burdened with managing several gateways [7].

### 3 Our Approach

We assumed throughout this paper the model based on Home M2M Network for web synchronization shown in Fig. 2. There are several constraints which must be satisfied to provide guarantees during multimedia transmission. They are time, space, device, frequency, and reliability constraints. Time constraints include delays. Space constraints are such as system buffers. Device constraints are such as frame grabbers allocation. Frequency constraints include network bandwidth and system bandwidth for data transmission. In this paper, we focus on how to represent web application synchronization based on Home M2M Network. Applications based on Home M2M Network request to execute a set of missions to Situation-aware Middleware with various requirements.



**Fig.2.** A Web Synchronization Agent based on Home M2M Network

This system is used to be one of services that are implemented on Remote Education System based on Home M2M Network. This Remote Education System includes several features such as Audio, Video, Whiteboard, WebNote running on Internet environment which is able to share HTML(Hyper Text Mark-up Language) based on Home M2M Network. We have implemented WebNote function based on Home M2M Network to do so either. While session based on Home M2M Network is ongoing, almost all participants are able to exchange HTML documents. For this reason, we need the URL synchronization based on Home M2M Network. The shared window based on Home M2M Network is a window shared by all the participants, and the modification carried out by the speaker is notified to every other participants. The local window based on Home M2M Network is not shared except initial file. The tool box provides various tools for editing contents of both the shared window and the local window. Teacher and students based on Home M2M Network use their local windows and shared window individually. The local window based on Home M2M Network has the lecture plans which is distributed at the beginning, and enables participants to memo and browsing other parts in the lesson plans, and has functions as a whiteboard based on Home M2M Network.

### 4 Simulation Results and Conclusions

As shown in Table 1, you can see the characteristic function of each system function for multimedia distance education.

**Table 1.** Analysis of Conventional Multimedia Distance Education System

Function	Sha- Stra	MER- MAID	MM- conf	CE- CED
OS	UNIX	UNIX	UNIX	UNIX
Development Location	Purdue Univ. USA	NEC, JAPAN	CamBridge USA	SRI, International
Development Year	1994	1990	1990	1993
Structure	Server /client	Server /client	Centralized or Replicated	Repli- cated
protocol	TCP/IP	TCP/IP	TCP/IP	TCP/IP multicast

This paper proposed a new model based on Home M2M Network for web synchronization control by analyzing the window and attributes of the attributes of the object, and based on this, a mechanism that offers a seamless view without interfering with error and application program sharing is also suggested. We remain an adaptive agent of error and application program sharing with error elimination function for domino effect based on a hybrid software architecture which is adopting the advantage of CACV and RARV based on Home M2M Network for web synchronization.

## References

1. Palmer W. Agnew, Anne S. Kellerman, Distributed Multimedia, ACM Press, 1996.
2. Michael G. Moore, Greg Kearsley, DISTANCE EDUCATION A System View, An International Thomson Publishing Company”, 1996.
3. Satyanarayanan, M.; “Pervasive computing: vision and challenges”, Personal Communications, IEEE[see also IEEE Wireless Communications, IEEE], Volume: 8 Issue: 4, Aug.2001 Page(s): 10-17.
4. Saha, D.; Mukherjee, A.; “Pervasive computing: a paradigm for the 21<sup>st</sup> century”, IEEE Computer, Volume: 36, Issue:3, March 2003, Page(s): 25-31.
5. S. Yau, F. Karim, Y. Wang, B. Wang, and S. Gupta, "Reconfigurable Context-Sensitive Middleware for Pervasive Computing," IEEE Pervasive Computing, 1(3), July-September 2002, pp. 33-40.
6. S. S. Yau and F. Karim, "Adaptive Middleware for Ubiquitous Computing Environments", Design and Analysis of Distributed Embedded Systems, Proc. IFIP 17th WCC, August 2002, Vol. 219, pp. 131-140.
7. Michael Starsinic, “System Architecture Challenges in the Home M2M Network”, 2010 IEEE.
8. K. Hwang, J. In, N. Park, D. Eom, "A design and Implementation of wireless sensor gateway for efficient querying and managing through world wide web," IEEE Transactions on Consumer Electronics, vol 49, issue 4, pp. 1090-1097, November 2003.