

STUDY ON 4G COMMUNICATION ARCHITECTURE COMPONENTS FOR SOCIAL NETWORKS

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ABSTRACT

The modern communication system is aimed to reach the real world one environment from virtual world via connecting resources of one with another through social network system. The communication process is aggravated various infrastructural development to reach in this current level such as 3G and 4G communication system. The user expectation also increased to meet their personal and social applications. The users are try to integrate the personal and social network technology with real time operations for their personal and business objectives. This paper is provides technological features of an existing 4G communication technology and its architecture to integrate the social networking process.

Keywords: *4G Communication system Architecture, Social Networking Architecture, Adaptive Modulation and coding (AMC), Adaptive Hybrid ARQ , MIMO AND OFDM, Open Distributed Ad-Hoc Wireless Network*

1. INTRODUCTION

Mobile systems focus on seamlessly integrating the existing wireless technologies including GSM, wireless LAN, and Bluetooth. 4G systems supports comprehensive and personalized services, providing stable system performance and quality service [1]. 4G is a Mobile multimedia, anytime anywhere, Global mobility support, integrated wireless solution, and customized personal service network system [2]. 4G is used broadly to include several types of broadband wireless access communication systems along with cellular telephone systems.

A 4G cellular system must have target peak data rates of up to approximately 100 Mbit/s for high mobility such as mobile access and up to approximately 1 Gbit/s for low mobility such as nomadic/local wireless access, according to the International Telecommunication Union [ITU] requirements. Scalable bandwidths up to at least 40 MHz should be provided. A 4G system is expected to provide a comprehensive and secure all-IP based solution where facilities such as IP telephony, ultra-broadband Internet access, gaming services and High Definition Television (HDTV) streamed multimedia may be provided to users.

In 4G networks, users joining the network via add mobile routers to the network infrastructure. Network capacity and coverage is dynamically shifted to accommodate changing user patterns. Wherever the concentration of people is more in one area, additional routes are created, thus enabling additional access to network capacity in terms of QoS. This permits the network to dynamically and automatically balance capacity and increase network utilization. The network is currently used social networking. The following part of the paper is deals with social networking and its technological issues.

2. TECHNOLOGY USED IN 4G COMMUNICATION SYSTEM

The infrastructure and the terminals of 4G will have almost all the standards from 2G to 4G implemented. The infrastructure for 4G will be only packet-based (all-IP). But there is suggestion to have an open Internet platform [2]. The 4G technology en suite with 802.16e mobile version of WiMax (also known as WiBro), and HC-SDMA, Adaptive Modulation and coding (AMC), Adaptive Hybrid ARQ , MIMO AND OFDM and Open distributed Ad-Hoc Wireless Network .

2.1 ADAPTIVE MODULATION AND CODING (AMC)

The principle of AMC is to change the modulation and coding format (transport format) in accordance with instantaneous variations in channel conditions, subject to system restrictions. AMC extends the system's ability to adapt to good channel conditions. Channel conditions should be estimated based on feedback from the receiver. AMC allows different data rates to be assigned to different users depending on their channel conditions. Since the channel conditions vary over time, the receiver collects a set of channel statistics that are used by both the transmitter and receiver to optimize system parameters such as modulation and coding, signal bandwidth, signal power, training period, channel estimation filters, and automatic gain control[3]. This AMC helped to integrate the 2G , 3G architecture uses into the forth coming 4G devices.

2.2 ADAPTIVE HYBRID ARQ

A successful broadband wireless system must have an efficient co-designed medium access control (MAC) layer for reliable link performance over the lossy wireless channel. The corresponding MAC is designed so that the TCP/IP layer sees a high-quality link it expects. This is achieved by an automatic retransmission and fragmentation mechanism called automatic Repeat Request (ARQ), wherein the transmitter breaks up packets received from higher layers into smaller sub packets, which are transmitted sequentially. If a sub packet is received incorrectly, the transmitter is requested to retransmit it[4]. ARQ can be seen as a mechanism for introducing time diversity into the system due to its capability to recover from noise, interference, and fades. It will retain the quality of service in terms of data transmission[5].

2.3 MULTI IN- MULTI OUT AND ORTHOGONAL FREQUENCY-DIVISION MULTIPLEXING (MIMO AND OFDM)

The challenge for wireless broadband access lies in providing a comparable quality of service for similar cost as competing wire line technologies. Increasing demand for high-performance 4G broadband wireless mobile calls for use of multiple antennas at both the base station and subscriber ends.

OFDM can be implemented efficiently by using fast Fourier transform (FFT) at the transmitter and receiver. At the receiver, FFT reduces the channel response into a multiplicative constant on a tone-by-tone basis. With multiple input multiple output (MIMO), the channel response becomes a matrix. Since each tone can be equalized independently, the complexity of space-time equalizers is avoided. Multi In and Multi Out and Orthogonal frequency-division multiplexing (OFDM) is chosen over a single carrier solution due to lower complexity of equalizers for high delay spread channels or high data rates [6]. A broadband signal is broken down into multiple narrowband carriers (tones), where each carrier is more robust to multipath. Multipath remains an advantage for a MIMO-OFDM system ; since frequency selectivity caused by multipath improves the rank distribution of the channel matrices across frequency tones, thereby increasing Capacity[7]. This allows 4G device can be act as multi transfer and multi receiver data communication.

2.4 OPEN DISTRIBUTED AD-HOC WIRELESS NETWORK

Routing infrastructure, including handsets, utilize intelligent routing capabilities to determine the best path for each transmission. Routing for the best path must be defined for least power. That is, network nodes must be able to calculate and update routing tables to send data packets through the paths with minimal power requirements [8]. This is different than network nodes associating with the physically closest available infrastructure. The 4G mobile system based on open wireless platform architecture will become the next wave in wireless communications.

The technology leads to integrate the computing network for human needs. At the same time, these technologies and the existing and upcoming 4G used to create the human network via computing devices. The social networking and it ecological issues are discussed below.

3. SOCIAL NETWORK SYSTEM

A social network site is a web site that Acts as a destination hub for individuals to establish relationships with co-workers and by doing so, enable them to jointly build, or expand, their professional and social networks. It includes different tools for people to interact with each

other, contribute information to the site, participate in different site activities, and build a sense of community in an informal and voluntary manner. It allows the user to define an online profile (or personal), list their connections (e.g., friends and colleagues), receive notifications on the activities of those connections participate in group or community activities, control permission, preference and privacy settings.

We define social network sites as web-based services that allow individuals to do the following

- [1] construct a public or semi-public profile within a bounded system
- [2] articulate a list of other users with whom they share a connection, and
- [3] View and traverse their list of connections and those made by others within the system.

The nature and nomenclature of these connections may vary from site to site [9].

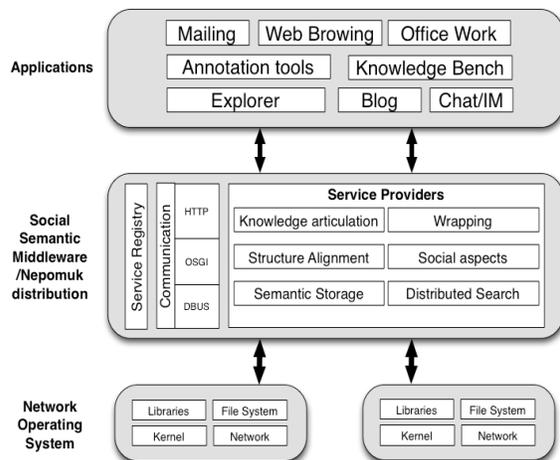


Figure . Social Network Architecture

In the existing social network sites are allowed to search the members, introduce the member, allow to send the message, share the photo, video and online chat etc. But the social networks are not realistic as we are interacting in a realistic work or environment. In the social network intermediate objects are skipped and an object member can establish the connection to the next member with its maximum degree level. This 4 G communication try to achieve the semantic technology application to the users. It is "Leveraging Semantic Technology for Infrastructure Mediation", explored how to use machine-to-machine intelligence for large scale

distributed computing networks, such as grids and cloud computing

4. SOCIAL NETWORK ARCHITECTURE

In the social network system has three layer processes. In this three layer application layer establish the interface with the user and rest of network process. In the interface level mailing, browsing, office work, annotations, knowledge bench, block and chat applications. These interface mainly used to maintain the communication with the social members and share information among the group. At the same time layer inherit to middle ware layer to register, crate communication and provide the service to application layers.

5.SOCIAL NETWORKING AND 4G TECHNOLOGY

The social networking process is an involved Varsity of networks such of Corporate Network, Home area network, Wireless Personal area network n Internet and vehicle area network. The combinational network represented below with its possible connectivity architecture.

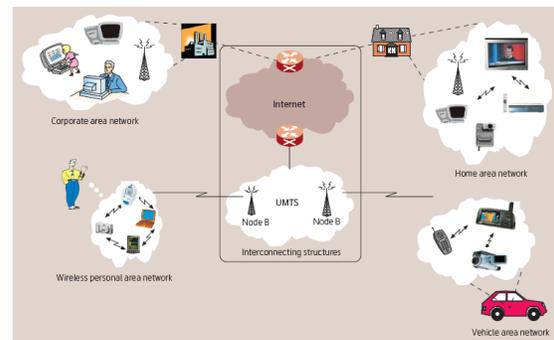


Figure: 4G Network Device Connectivity

While we are constructing the social network that will provide infrastructure service, web site content and application, relation control and participation model. Relation control and participation model work together to enrich the social presence of the registered user of the social network group member, Actor profile and Social Graph. The infrastructure model provides the facility to Collaboration & Content service and Social Networking services. The social network architecture is simulates the Cloud computing architecture.

6. FLEXIBILITY OF 4G ARCHITECTURE FOR SOCIAL NETWORKING

4G Communication architecture will provide access through a collection of radio interfaces, seamless roaming/handover and the best-connected service, combining multiple radio access interfaces (such as WLAN, Bluetooth and GPRS) into a single network that subscribers may use. It allows any mobile device to seamlessly roam over different wireless technologies automatically, using the best connection available for the intended use. Users will have access to different services, increased coverage, the convenience of a single device, one bill with reduced total access cost, and more reliable wireless access even with the failure or loss of one or more networks. This technology supported with the support of Hardware as service (Haas) to the social networking members. They can access the network communication system using any available network infrastructure as a Service (IaaS).

In the 4G architecture, a single physical 4G communication device with multiple interfaces to access services on different wireless networks. The multimode device architecture may improve call completion and expand effective coverage area. The device itself incorporates most of the additional complexity without requiring wireless network modification or employing inter-working devices. Each network can deploy a database that keeps track of user location, device capabilities, network conditions, and user preferences. It allow the social network user to connect the rest of the network members without any modification of his/her infrastructure, application, services and the architecture of communication system.

7. CONCLUSION

4G communication system is dwell in many application of real time communication system with High speed network capacity, Fast/seamless handover across multiple networks, Wireless access technologies, MIMO and Multimedia support. The high end 4G communication architecture have flexibility to construct the social networking process in an effective manner to integrate the corporate, private and public network. This study provides the possible technology adaptation for the social networking effective process using 4G communication architecture. The study will lead to find the

design architecture of secured and effective social networking information architecture using Hardware, Infrastructure, Software, platform, Communication, data storage service with Effective Quality of Services. The researcher aimed to construct the 4G based social network for the academic enhancement for the its stakeholders in India with the knowledge sharing portal using the above specified attributes.

REFERENCES

- [1] Suk Yu Hui Kai Hau Yeung, City Univ. of Hong Kong, China; *Challenges in the migration to 4G mobile systems Communications Magazine, IEEE* Volume: 41, Issue: 12 ISSN: 0163-6804 Dec. 2003
- [2] Moray Rumney, "IMT-Advanced: 4G Wireless Takes Shape in an Olympic Year", *Agilent Measurement Journal*, September 2008
- [3] Chia-Hao Yu, Olav Tirkkonen Rate adaptation design for adaptive modulation/coding systems with hybrid ARQ ISBN:978-1-60558-569-7, Proceedings of the 2009 International Conference on Wireless Communications and Mobile Computing, ACM New York, NY, USA
- [4] Sunghyun Choi and Kag G. Shin A Class of Adaptive Hybrid ARQ Schemes for Wireless Links *IEEE Transactions on Vehicular Technology* 2001 volume 50, pages 777—790
- [5] Samir Kallel, Sattar Bakhtiyari, Robert Link An Adaptive Hybrid ARQ Scheme *Wireless Personal Communications*, ISSN:0929-6212 Volume 12, Issue 3 (March 2000) Pages: 297 - 311
- [6] P. Uthansaku M.E. Bialkows "Multipath signal effect on the capacity of MIMO, MIMO-OFDM and spread MIMO-OFDM" *Microwaves, Radar and Wireless Communications*, 2004. MIKON-2004. 15th International Conference on, Volume: 3, 17-19 May 2004 Pages:989 – 992
- [7] A.J. Paulraj, D.A. Gore, R.U. Nabar, H. Bölcskei, "An overview of MIMO communications - a key to gigabit wireless"

Proceedings of the IEEE ,Volume: 92 ,
Issue: 2 , Feb. 2004 Pages:198 – 218

- [8] Anna Scaglione, Dennis L. Goeckel and J. Nicholas Laneman, Open Architecture for Future Wireless Communications , University of Massachusetts, Amherst 2006
- [9] boyd, d. m., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. Journal of Computer-Mediated Communication, 13(1), article 11.