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Live Multimedia Streaming Approach with J2ME for 4G Networks

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ABSTRACT

This paper describes research in the use of The Java 2Platform, Micro Edition (J2ME) for live multimedia streaming approach for 4G networks. This paper introduces the structure of our J2ME computer vision library. A Midlet deployment is presented. The J2ME Wireless Toolkit provides a compiling and testing environment for developing applications for CLDC/MIDP compliant mobile phones.

Keywords: CDMA; WCDMA; 3G; 4G; J2ME

I. INTRODUCTION

Java 2 Micro Edition (J2ME) is a runtime environment for resource-constrained environments. J2ME includes specific virtual machines, configurations and profiles for various environments and needs. With an appropriate configuration and profile, J2ME applications could be executed within pagers, mobile phones, PDAs, set-top boxes and automobile navigation systems.

4G or 4^{TH} Generation is a family of standards for wireless communications defined by the International Telecommunication Union, which includes GSM EDGE, UMTS, and CDMA2000 as well as DECT and WiMAX. Services include wide-area wireless voice telephone, video calls, and wireless data, all in a mobile environment. Compared to 2G and 3G services, 4G allows simultaneous use of speech and data services and higher data rates (up to 100MBPS). Thus, 4G networks enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency.

4G is the next generation of wireless networks that is supposed to provide its customers with better speed and all IP based multimedia services. 4G is all about an integrated, global network that will be able to provide a comprehensive IP solution where voice, data and streamed multimedia can be given to users on an "Anytime, Anywhere" basis. At present we have many technologies each capable of performing functions like supporting voice traffic using voice over IP (VoIP), broadband data access in mobile environment etc., but there is a great need of deploying such technologies that can integrate all these systems into a single unified system. 4G presents a solution of this problem as it is all about seamlessly integrating the terminals, networks and applications. The race to implement 4G is accelerating as well as quite challenging. But to support mobile multimedia applications, 3G had to deliver packet-switched data with better spectral efficiency, at far greater speeds. 4GPP technologies evolved as follows.

- ✓ General Packet Radio Service (GPRS) offered speeds up to 114 Kbps.
- ✓ Enhanced Data Rates for Global Evolution (EDGE) reached up to 384 Kbps.
- ✓ UMTS Wideband CDMA (WCDMA) offered High Speed Downlink Packet Access (HSDPA) boosted the downlink to 14Mbps.
- ✓ LTE Evolved UMTS Terrestrial Radio Access (E-UTRA) is aiming for 100 Mbps.

As 4G adoption accelerates, handset manufacturing, 4G carriers, semiconductor OEM's, infrastructure equipment makers, and 4G application providers stand to gain. Wireless Internet Service Providers, carriers without the wherewithal or financial resources to upgrade their networks, and companies that provide services which are standard under 4G, will be in a position to lose. With the

capability for high-speed wireless data transfer, 4G has enhanced or made possible a myriad of additional applications such as mobile video, secure mobile ecommerce, location-based services, mobile gaming and audio on demand. The typical services associated with 4G include wireless voice telephony and broadband wireless data, all in a mobile environment.

II. METHODS AND MATERIAL

Architecture of J2ME

J2ME uses configurations and profiles to customize the Java Runtime Environment (JRE). As a complete JRE, J2ME is comprised of a configuration, which determines the JVM used, and a profile, which defines the application by adding domain-specific classes. The configuration defines the basic run-time environment as a set of core classes and a specific JVM that run on specific types of devices. The profile defines the application; specifically, it adds domain-specific classes to the J2ME configuration to define certain uses for devices. J2ME also provides technology specific APIs that extends the capabilities of a Java application environment.J2ME architecture doesn't replace the operating system of a small computing device. Instead, J2ME architecture consists of layers located above the native operating system. The following Figure A depicts the relationship between the different virtual machines, configurations, and profiles

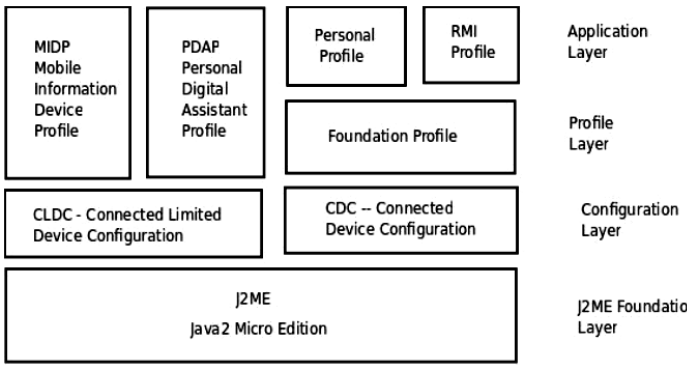

Figure A: Architecture of J2ME

Figure B. is an overview of the components of Java ME technology The configuration targeting resource-constraint devices like mobile phones is called the Connected Limited Device Configuration (CLDC). It is specifically designed to meet the needs for a Java platform to run on devices with limited memory, processing power and graphical capabilities. For a CLDC and MIDP environment, which is typically what most mobile devices today are implemented with, a MIDlet is then created. A MIDlet is the application created by a Java ME software developer, such as a game, a business application or other mobile features. These MIDlets can be written once and run on every available device conforming with the specifications for Java ME technology. (see Fig B) Figure B. The Connected Limited Device Configuration (CLDC)

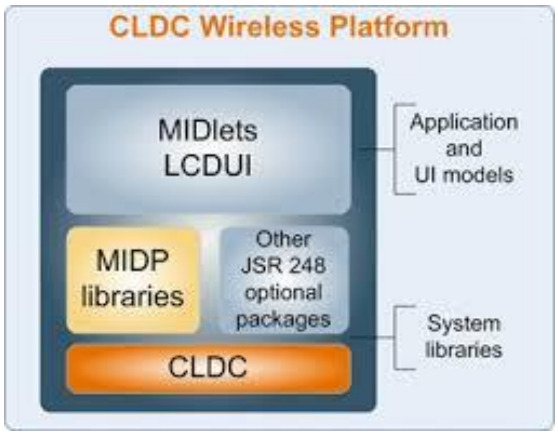

Figure B: The Connected Limited Device Configuration (CLDC)

The configuration targeted larger devices with more capacity and with a network-connection, like high-end personal digital assistants, and set-top boxes, is called the Connected Device Profile (CDC). Looking at the benefits the CDC configuration brings to the different groups in the value-chain the following can be said: (see Fig C)

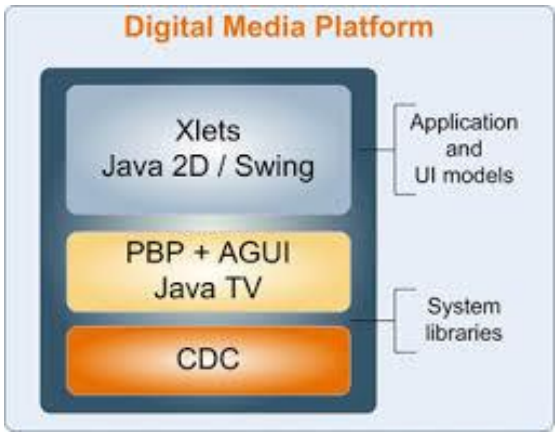

Figure C: The Connected Device Configuration (CDC)

III. RESULTS AND DISCUSSION

MIDlet Deployment

MIDlet suites can be deployed to a web server and made available for download. Deploying to a web server is the most common method for making MIDlet suites widely available, but MIDlet suites may also be transferred to a MID using e.g. a Bluetooth connection or a cable connection.

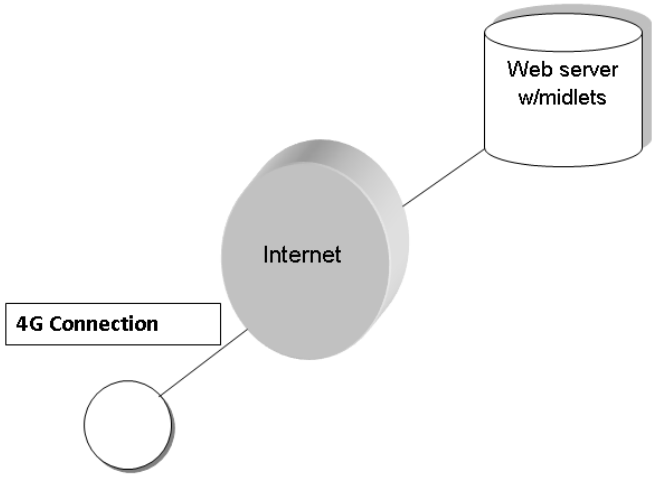

Figure D : MIDlet Deployment

The Java Bluetooth applications described later in this thesis are deployed to the author's web server and may be downloaded through a HTTP or WAP enabled browser.

Figure D: shows that a mobile device may connect to the Internet by using a 4G connection. A MIDlet can then be downloaded from a web server on the Internet, simply by entering the URL to the desired MIDlet's .jad file in a HTTP or WAP browser.

IV. CONCLUSION

Along with the rapid development of information technology, executing e-commerce through mobile handset is the main development direction. In this article, we can use the J2ME for live multimedia streaming approach for 4G networks. Web Service is used to deal with the interaction between the server end and the customer end， and supports the issue of backstage service end program. In the future, the devices we use today, such as voice devices, DVD, PC desktops, cars, and appliances, will be interconnected. The controls for these devices can be centralized in a portable wireless console. From your car, you will be able to use your wireless console to select music from your PC in your home and start baking a cake in your oven. Multimedia will play an increasingly more important role in this wireless world.

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