Investigation into Mobile Development Tools and Technology for Mobile Games and Application

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Abstract

Mobile devices have come a long way with the advancements in terms of processors, memory etc. This has brought about flexibility for development of platforms and different applications far more superior to older ones used and has prompted research into better methods of deployment and use of mobile device capabilities. This paper looks at different technological advancements in progress and also proposes a plan for future work evaluates current and future developments..

1. Introduction

As the mobile devices continue to become more sophisticated with time and capital investments being poured into the industry to enable production of better devices there is more room for play in terms of production of more sophisticated software (games and multimedia applications) geared towards mobile devices [2]. Mobile games and applications have also come along way from the days of black and white snake ages. There has been a significant improvement in terms of graphics and playability all within the limitations associated with mobile devices in terms of hardware capabilities and communication. Games as we know them have three different parts physics, graphics and game AI. When it comes to mobile device games then the use of these tools has to be limited due to the inherent limitations faced by developers unlike their PC and purpose built game stations like the Playstation, Xbox, etc. This has to some extent been looked at with the development of tools that could help design more appealing games like the Gapi draw [11] and Opentrek [11] platforms for graphics and networking. The gapi draw in particular does go a long way in improving graphics and thus overall look of the games. As for the physics capability there are dots of it but not to the extent that a player would like and lets face it as the generations of mobile users change the more demanding they become when it comes to the overall quality of the games they purchase for their mobile devices be it FSP's, strategy, sports or even the puzzle games. A survey done by Nokia has shown figures for people that love playing mobile games while waiting for their means of transport is getting higher [3]. This type of games requires different degree of capabilities in terms of physics, graphics and game AI engines. The PCs or PS2 and Xbox games have different engines that deal with the complex nature of each and thus like pieces of a puzzle once fitted together the game developed is a sight for sore eyes in most cases. The game AI has been developed in such away that could literally increase the amount of AI that is currently available on mobile games. The rule based development environments require powerful computers with fast processors but this may not necessarily be untrue [1]. This requirement may be needed only during the development stages after which they can be deployed to less powerful devices. Once the knowledge base is developed, it can be extracted and combined with an MEE (Mimosa Execution Environment) a light weight interpreter for the mimosa language targeted at a particular subclass of mobile devices [1]. There are some MEE's constructed for different languages for devices running different operating systems including Symbian, WinCE etc [1].

The development of game engines for mobile phones require more critical evaluation of the strengths and weaknesses of mobile devices and this should be taken into account when developing these engines [2].

2. 2.Development Platforms

There are different platforms for game and application development available for mobile devices including J2ME, Windows Mobile, Brew, and Jamdat. Windows mobile is a development platform for smart phones and PDA's. It addresses different aspects with regards to developing applications and games for mobile devices (10). There are two instances for windows mobile SDK one for smartphones and the other for PDA's [10]. The use of Windows CE is restricted to PDA's and deals with the development platform that supports windows CE

(.NET CF platform). This is due to the fact that .NET CE still needs about 2MB space for it to be installed and run on mobile devices which is mostly seen in smart phones and PDA's [12]. It is designed for windows based CE compliant PDA's and smartphones [14]. As compared to J2ME it is not open-source which does prove to be more cumbersome when it is used in research purposes [13].

J2ME is a collection of configurations, profiles and optional packages fitted like a puzzle into a compliant development platform for applications on mobile devices. It is branched into two paths CDC (connected device configuration) and CLDC (Connected limited device configuration) profiles where the former caters for more hi-end tiered mobile devices while the latter supports more average mobile devices with more stringent memory and processor capability. Thus CDC is a superset of CLDC. J2ME consists of three layers a virtual machine, configuration and profile. The java virtual machine is placed at the lowest level and interacts with the operating system available it exists in two types that are already mentioned above namely CDC and CLDC [12]. There are different components are used for mobile wireless devices as can be seen in Fig 1 [4].

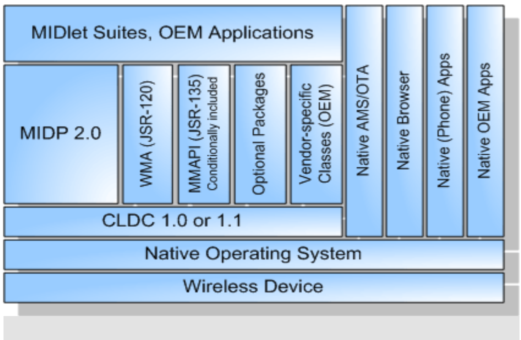

Fig 1: Mobile phone software components [4]

Thus the CLDC incorporates MIDP (Mobile Information Device Profile) profile. MIDP has so far been reviewed and the latest version out is the MIDP 2.0 with game API which is an asset as far as mobile game programming is concerned and has refined a lot of the problems associated with MIDP 1.0 providing more features for the mobile game programmer to work with including collision detection, sprites, tiled backgrounds, layers and layer management [13]. This addresses some of the challenges which have been experienced with MIDP 1.0, for example, Collision detection in MIDP 1.0 was not addressed but it is included in MIDP 2.0.

A TimerTask had to be run and used to check every half a second whether the ships had collided or not. If detected then the timer would stop as shown in listing below:

```
Public class CheckWinTimerTask extends
          TimerTask {
Public void run() {
   If (( ship.friend.x < ship.foerightx)&&
       ( ship.friend.x > ship.foeleftx)&&
       ( ship.friend.y < ship.foebottomy)&&
       ( ship.friend.y > ship.foetopy)){
     System.out.println("CAUGHT");
     Ship.caught = true;
    }
   If ( ship.caught == true) {
          fspTimer.cancel();
          foe.TimerTask.cancel ();
          checkWinTimerTask.cancel ();
    }
  }
}
```

The collision detection in MIDP 2.0 can be performed a lot easier with less coding as shown below:

```
Private void checkShips () {
   If ( ship.collidesWith (ship2, true)) {
        Ship.undo ();
        Stop ();
     }
}
```

It is free to download and use in its entirety and has a very wide support base though it has its own limitations [4].

Brew is a Qualcomm ingenuity targeted at its CDMA (code division multiple access) technology. It supports C, C++, Java and XML. It however needs brew based chipsets for it to work thus restricting it to brew chipset phones only [15]. Its applications are compiled to machine code which enhances its speed. As far as the data storage is concerned brew allows bit level manipulation which increases its efficiency in this area. Brew does also have some costs which a developer incurs before gaining some much needed tools for development [15].

There are different graphics platforms being used to create graphics for mobile games and multimedia applications that are required by different hardware configurations of these devices [11]. Also there are different types of graphic APIs for handheld graphics development including Java based graphics APIs, Frame-buffer APIs and Graphics hardware APIs. They all seem to have influenced the developers to think about moulding their products towards the devices they are trying to create them for thus creating more gruelling work [11]. The development platform for graphics extends to different mobile devices and operates on palm, symbian as well as windows mobile [11]. The GAPI platform is a mixture of frame buffer API and Graphics API. It is a platform that can be used to develop high performance graphics and can be used on a normal pc and the product implemented onto the mobile device without downscaling and at the same time the developers need not worry about device specificities and can concentrate solely on their products logic. It has so far been used in quite a few research projects including Tilt and Feel which explores the use of mobile devices with a tilt sensor and a vibrotactile transducer [18]. It has also been used in education where it has been used for teaching students software development on mobile devices along with the OpenTrek platform for networks. Thus this shows that it is an enabler platform that can be used to pioneer new mobile device applications and concepts to be tested on mobile devices [11].

3. Grid Computing and Mobile Devices

Grid computing is rooted to the high performance computing area. There have been three approaches so far towards providing alternatives to the massively parallel processor systems. These include Local area Networks of work stations (NOW) thus providing low cost high performance computing e.g. Beowulf systems. The second approach is the use of geographically diverse supercomputing resources via high speed networks bringing together gigaflop capable centres to form teraflop capable virtual super PCs yielding huge amounts of performance for applications that require this. The third approach is most like peer to peer file sharing where included with this file sharing is computation, bandwidth and storage [8].

There has been a lot of research now being funded in terms of research into mobile devices on formation and usage of grid services and resources. This is a pool of untapped enrichment that needs to be focused on. So far there has been progress within this area with research being able to break boundaries of enabling the mobile devices to tap into the resources available from computing grids. This has been tried and tested with much success as seen in different research work like GridLite a framework for managing and provisioning services on grid-enabled resource limited devices. It is a framework that has been tested at the HP laboratories and is used to minimise resource constraints of mobile devices using the intelligent grid infrastructure [5]. It is however pointed towards smart phones and PDAs thus cutting out the rest of the mobile phones that are around. Condor grid computing research has initiated research into integrating mobile devices into the grid. Condor is on its own is a grid architecture that runs on a set of heterogeneous computers. Each PC executes two daemons including a scheduling daemon and a starter daemon for launching new jobs. Thus helping tap into the grid infrastructure (6).

Another addition is the proxy-based clustered architecture which is seen as a way of integrating mobile devices through an interlocutor (intermediary) preferably a laptop which provides a link between the devices and the grid infrastructure as shown in Fig 2 [8].

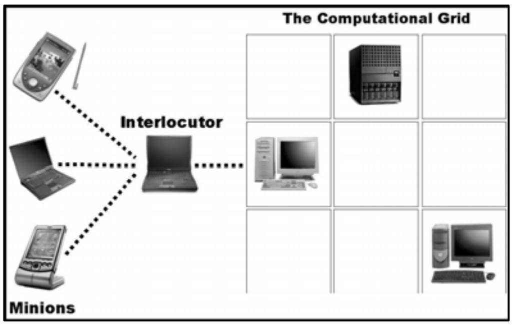

Fig 2: A Broad view of the proxy-based clustered architecture [8]

Mobile OGSI.NET is the first venture in terms of exploiting the possibilities of a native mobile grid. The use of OGSI standards from Globus in creating an infrastructure for mobiles to co-operate and share resources and at the same time is able to tap into the computer grid infrastructure has been implemented. The facts that it has been set for windows CE compliant handsets mostly pocket PCs. It presents a glimpse into the future to come. Figure 3 shows how the relationship of OGSI.NET with device hardware and software layers.

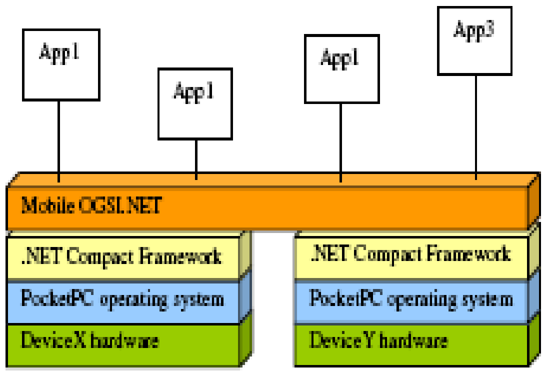

Fig 3: Mobile OGSI.NET and its relation to other device hardware/software layers [9].

This is also shown that the ability to create and assimilate a mobile grid infrastructure is not out of reach but just needs more research and refinement [9].

A lot of research on mobile devices and grid integration has been done using Globus and condor grid infrastructure. There is another infrastructure which has by far been left out called Plan 9. Plan 9 is a distributed operating system that us able to create and maintain per process distributed environments independent of the physical location of resources [16]. Thus unlike globus Plan 9 provides allows for grid creation without changes being made or middleware being created. Thus the two of them show two different approaches to making of grids [16]. It being an operating system that is grid enabled it offers good principles in terms of authentication processes, data management processes, network management and also security principles which could aid in building a strong more reliable and secure grids in the future [16].

A lot more work has been done towards adhoc mobile grid applications specifically MoGrid a project done in brazil for peer 2 peer resource discovery on mobile grids thus the MoGrid application. This has focused more on adhoc networks aiming to provide collaborative support towards applications that run purely on adhoc networks [17].

The utilization of technology available towards formation of mobile grids may unleash a better more efficient game playing environment for mobile device owners. If harnessed then the potential for mobile games and applications becoming even more enhanced in terms of physics, graphics and AI. It would help in easing the load of processor power in terms of being able to play or run more intense games or applications that may need more processing resources than the device can offer. Thus the use of other devices within its reach comes in handy.

4. Communication in Mobile devices

There are a quite a few established communication methods when it comes to mobile devices. The client/server network models seem to be favoured over others. This can be seen by the use of a central point of resource coordination which still poses restrictive and centralised approach on wireless network infrastructure [17]. Thus client server models serve as a major basic network communication model used in construction of wireless networks as far as mobile grids are concerned. Another model that has been used so far is the peer 2 peer model that provides flexibility, less restrictive and decentralised approach towards mobile networks. This can be seen in MOGRID project that pioneers the use of a peer 2 peer discovery protocol layer that allows the distribution of grid tasks in decentralised and dependant on different factors among mobile devices [17]. This project is still in development and further tests are being conducted with regards to its capabilities.

The use of communication standards however provides another challenge as different devices allow different types of wireless communication for example WLAN, Bluetooth, GPRS, WAP, 3G etc. There are some studies still being undertaken as to sourcing out the best possible. Till this moment though each type has its own strengths and can be used according to different situations arising.

5. Future Proposal

Thus there has been a lot of development on mobile grids but along the principles of condor and Globus grid software which has so far been quite successful. However there are other avenues that can be exploited as far as creating mobile grids is concerned which may prove a lot more beneficial too in terms of security, data management, resource management etc. this has led to the idea of investigating the workings of plan 9 and inferno. Plan 9 being a distributed operating system that is grid enabled which may give key contributions toward forming tighter secure networks over mobile grids and reducing the risks involved in climbing onto a grid and letting resources from ones mobile device be utilised. The proposed idea will be investigated with an aim of developing an adhoc independent mobile grid protocol that can be used for different resource intensive tasks. The use of different mobile devices to make up the grid is the main focus for this project. In this work, we aim to explore the use of plan 9 as a grid enabled platform. Experiment with its architecture, principles, process handling, and network communication capabilities etc., will allow for the further development of an adhoc grid enabled OS that could be used as a grid protocol for mobile devices modelled under the Plan 9 and inferno architecture and processes.

So first the exploration of Plan 9 will commence where appropriate scenarios are drafted in to test its capabilities and give an insight to how it would support the creation of adhoc mobile grids.

There will be more research into inferno which draws from plan 9 and is supposed to be a more compact platform and has similar qualities to plan 9. This will help in assessing its suitability as a portable operating system or application on mobile devices.

Networking will be looked at in different aspects and with regards to different scenarios thus the use of blue tooth, 3G, WLAN, WIFI among others will be debated by assessing different situations including areas with little or no wireless capability, areas of confined space and on open ground etc. This will therefore affect the choices of which protocols will be included for communication between the devices.

Another aspect will be addressed is the security principles that are offered by plan 9 and assess their suitability to mobile device grid security. Thus a suitable test bed will be used to assess it and the results will therefore shape the direction in which the security aspect of the adhoc mobile grid will be decided.

6. Conclusion

The research so far has proved an invigorating experience and with new mobile devices being unveiled every quarter there is room for more advancement in terms of mobile applications and

games. This paper goes to an extent to show the research being done thus far in the field. As for the development of mobile grids there are still more improvements being developed due to the increased capabilities being seen on new devices.
The use grid computing for mobile devices has been a good turning point as far as use of these supercomputer highly intensive resources is concerned. This in time will bring about the enhancement of games and multimedia applications thus bridging the QOS gap between mobile devices applications and desktop computers. A new dawn seems to have come of age since the breakthrough into grid computing for mobile devices was realised. The realisation of how application graphics, features, AI components especially in games, physics capabilities can be improved. Thus with the future proposal that has been briefly outlined in this paper there is hope of even further accomplishments in the mobile grid computing field with benefits being realised for mobile multiplayer games and multimedia real time applications.

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