Lightweight Architecture for Mobile Web Content Access over Enterprise Cloud Mashup

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ABSTRACT**:** *The web is the most important platform of our generation. Today web is commonly used to encompass various novel phenomena on the World Wide Web, for example Web 2.0 required a big growth of bi-directional communication. The fast growth of web technology such as: technological scripting and presentation technologies (used to render the web site and allow user interaction), delivered a hard access of web contents and resources and demanded more computational power at both of client and server sides. In the context of web future, the term cloud computing is being widely used these days [1], the alliance of cloud computing, wireless communication infrastructure, mobile devices [2], [3], and mobile web, has introduced an innovative computing model, called mobile cloud computing.*

One of the big problems facing any web content model is how to maintain a %100 up running time. This couldn't be achieved using traditional web servers, not to mention administration, maintenance and security will become a nightmare for fast growing web content. There is neither scalability nor instancing in the traditional web server's model. Today's mobile web model still lacks in resources compared to conventional information processing devices such as a workstations [4], [5], laptops and mobile devices. To offer fancy web content we need more server computational power and much more resources, one of ways to overcome this limitation is mobile cloud computing,

Finally, the lightweight architecture for mobile web content access over enterprise cloud mashup (LAMWEC) is proposed to move the world into faster web content implementation [6], more stable web with extra uptime, remove the administrative burden, and simple mobile web site content development through employing the hybrid web application technology using cloud model that will host the application core, and weaving this with the traditional servers that will host separate unique web contents, to offer a fancy mobile mashup cloud computing or hybrid mobile web cloud content with faster access technique.

Keywords: Cloud Computing, Hybrid Web Applications, Mobile Applications, Mobile and Cloud Computing, Data as a Services, Mobile Browsing, Enterprise Cloud Mashup

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1. Introduction

If we take in our consideration that today's web content model is moving very fast towards Content Management Systems (CMS) application, so there is a need to address a proper architecture to provide integration between all the previous issues and to offer the solution in one single CMS system.

A special CMS clustering and hybrid application architecture have to be developed, by distributing it into multiple layers [7],

physical distribution and application distribution layers, having kernel core for any running CMS application hosted over the cloud server, each new web content will use the same kernel from the main cloud network, and implement its GUI interface and database management form a traditional server, a smart adaptive mobile web content will be developed based on optimized data transfer size thus transferring the computation load from mobile devices to the cloud [8], [9], [10] .

Client request will be seen as entry points and interface of cloud online services. First client request will start by sending a request to the main cloud server, which will build the content through calling the shared kernel which is cached to provide a faster web processing, the main cloud server will pass the kernel parameters to the main server, that host this web content which will build the GUI layer with its content from the database server, the response will use a custom data format to enhancing the transfer data size with the smart optimizer, we will pass this to the nearest edge server for this client to facilitate the content access, this server will cache the last running result to produce a caching model for the next request, this will introduces a new archetype for both desktop user and mobile web architectures.

We plan to implement a virtualization and internet based application delivery [11], [12], using the phenomenon of clouding technology, cloud computing allows various tasks to be executed over a network using various services. This will include scalability, better performance and services oriented to reduce of the cost and availability of agile application development [13].

This paper provide a new architecture model for a general purpose web content that host your template under your own 2 server, the CMS core will enjoy with the huge power of cloud networks, we will use Joomla CMS as a case study in our implementation, this does not mean that the new architecture is for a specific web application but its general enough to be used also with any web application that use the CMS concepts that is based on template engines approach, the LAMWEC will allow you to enjoy the cloud power for system core for server side, and access web content from normal desktop or mobile device, with best treatment for mobile devices.

The paper contribution is to create new architecture, for hybrid mobile web cloud content to enable your mobile web application to be developed, deploy, managed, administer or published easier and faster than previous, using mashup, cloud computing and new smart techniques from web technology, with the proposed architecture, the mobile web content will run faster and simpler than before, with new enhanced feature and enjoy with a new benefits.

The rest of the paper is organized as follows, in section 2, we discuss some topics for exploration, section 3 related work, section 4 we discuss the features of the proposed architecture and how it could help the web publish industry, section 5 architecture design, section 6 architecture model definition, and finally section 7 is the conclusion and future work.

2. Topics for Exploration or (Literature Background)

2.1 Hybrid Web Applications (Mashup)

We start thinking to use mashup when we notice that there are some problems that face webmasters, web developers and web designers in their everyday life, this problem comes from the nature of web technology, the mashup could solve a big part from this problem, since it's fairly easy to implement the web content from different online services. mashup is a web page or application that combines resources or functionalities from two or more sources creating a new application or service, mashup is an emerging software engineering paradigm aligned with the trend towards the programmable web [8], mashup is based on the longest tail theory which is from business perspective, is it to allow to use different services, to break down business processes into smaller pieces this allowing an acceleration considerably and speed to a new business services are deployed, this theory describes a business strategy based on selling many small volumes of hard to find items instead of a few large volumes of popular items, long tail theory is based on selling less of more.

The history of mashup comes from music industry before it become an internet popular concept, when musicians create mixture of two or more tracks to create a new song this is called mashup, this could be called also multi track recording and re-recording, this notable advances on the field was done in the past by the famous band Beatles, figure 1 illustrate the concept of mashup for internet technology. Today web mashups are becoming one of the salient tools for providing composite services to meet users request, this open a new area for researchers to many endeavors to enhance this technology web users, many approaches used now for mashup some of them for mobile web, web application or even for web application programming interface (API), one of this contributions is a method to utilizes the social and functional relationships among web APIs to produce and recommend the

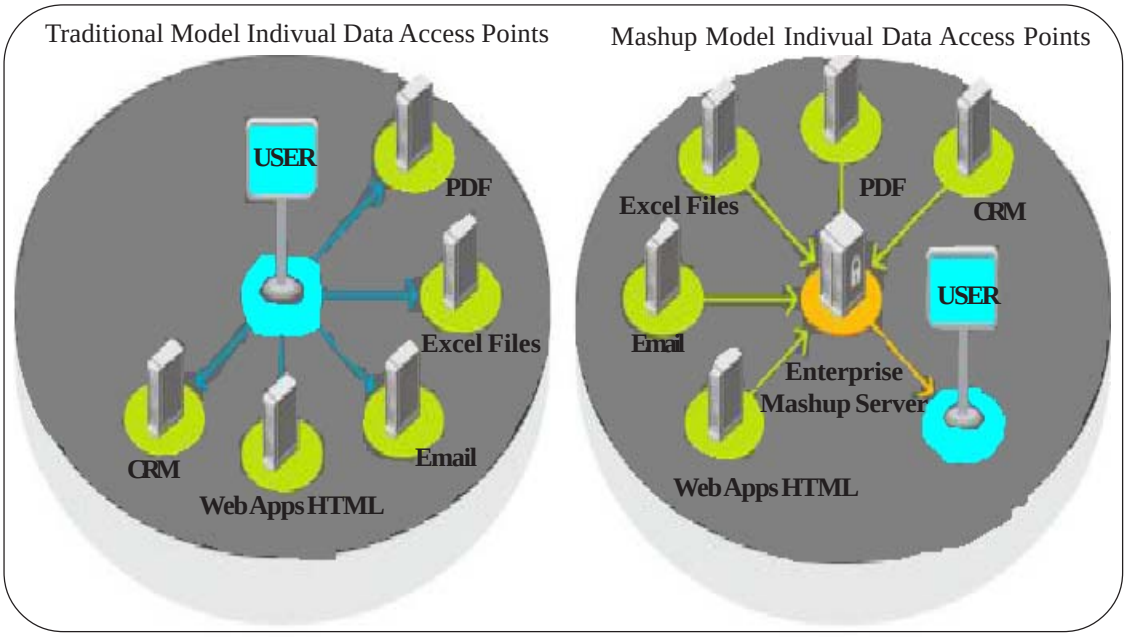

Figure 1. Concept of Mashup for Internet Technology

chains of candidate mashup [14].

2.1.1 Mashup types

Mashups can be categorized into three main types which is, data mashups, consumer mashups and business mashups [6], the consumer mashup is the most common category because it designed for general public, but business mashups are becoming popular because it allow a better usage of the resources of the enterprises, and data mashups are normally used to combine and reformat information, bellow we will explain more about this three categories.

2.1.2 Data mashups

aim to combine similar multiple types of media or information from multiple data sources into a single representation, the combination of all these resources create a new representation, this new representation is a distinct web service from the sources and provides data in a new, this new web service that was not originally provided by either source, en example for this is Skyscanner.com since it combines data and provides flight tickets from multiple sources such as British Airways, Air France and Iberia.

2.1.3 Consumer mashups

It is designed for the general public, it considered as opposite of data mashup because it normally combine multiple public data sources of different data types into a visual representation, consumer mashup is a very effective mean for personalizing data according to the customer's needs, Wikipediavision is an example of consumer mashup, it combines real time data from the Wikipedia with Google Maps allowing users to see real time edits to Wikipedia on a world map.

2.1.4 Business mashup

Sometimes called as enterprise mashup, business mashup aim to solve business problems like consumer mashup, but its work different from consumer mashup in other aspects such as the security levels required, the level of sophistication, its need of quality of Service 3 (QoS), and some other aspects, business mashup define applications that combine their own resources, application and data, with other external web services, or generally combine internal information and services of an enterprise with external resources into a visually rich web application, it focus data into a single presentation and allow for collaborative action among businesses and developers, enterprise mashups are secure, visually rich web applications that expose actionable information from diverse internal and external information sources, an example of this category could be PivotalTracker, is a web-based agile project management tool, allows integration with Twitter, where project's members can see real-time updates.

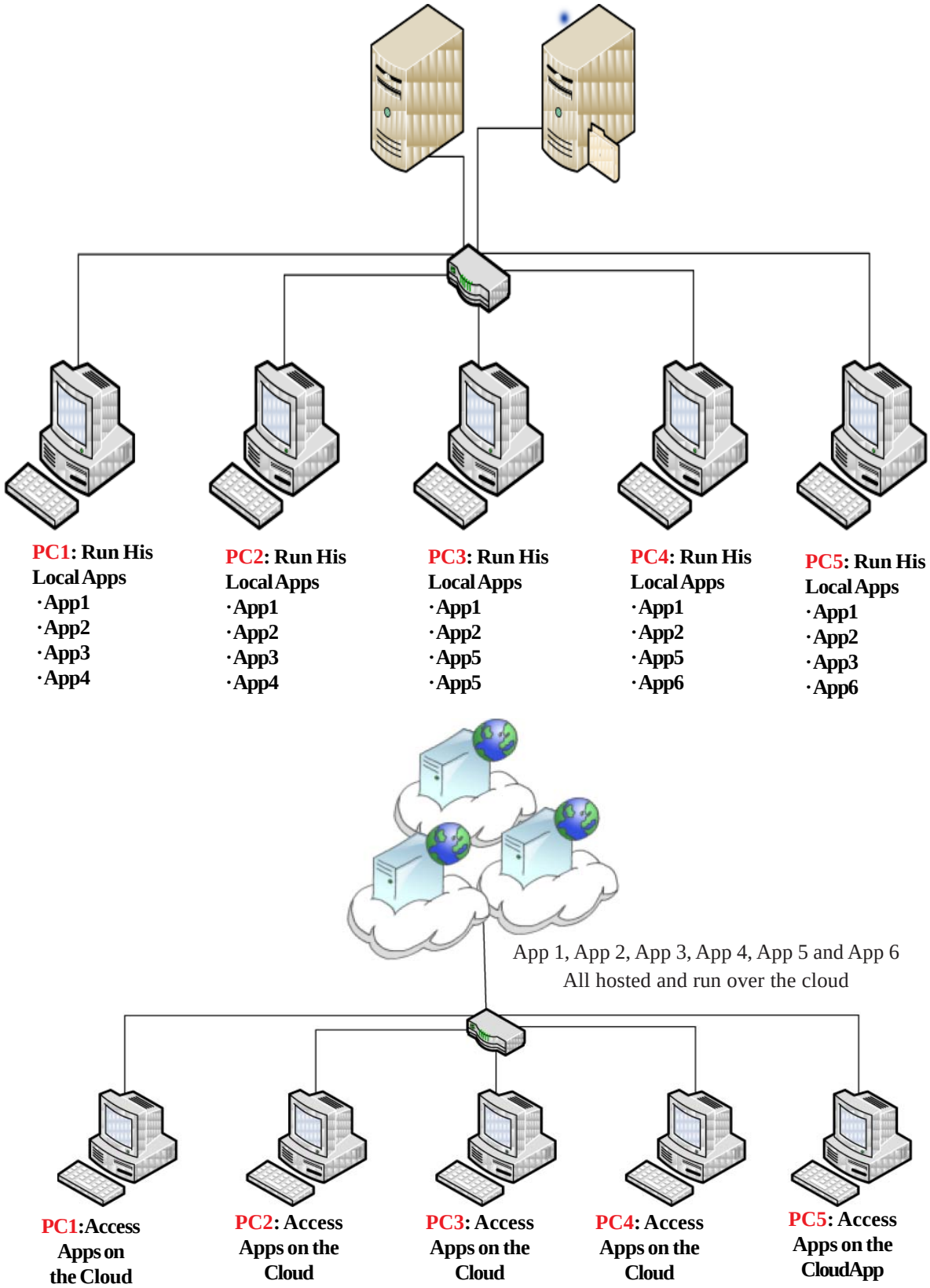

Figure 2. From traditional desktop application to cloud application

2.2 Cloud Architecture

Cloud Computing is the latest paradigm that involves delivering hosted services over the internet. Cloud is the most hyped word in the world, and everyone in the industry has his own definition. Cloud computing lets you access all your applications and documents from anywhere in the world, freeing you from the confines of the desktop and making it easier for group members in different locations to collaborate. Cloud computing is a new promising technology that is about how we store information and run applications, instead of running programs and data on an individual desktop computer, in cloud everything is hosted in the cloud network, which is collection of computers and servers accessed via the Internet. The history of cloud computing is coming from the electricity revolution of a century ago, before the advent of electrical utilities, every farm and business produced its own electricity from freestanding generators. After the electrical grid was created, farms and businesses shut down their generators and bought electricity from the utilities, at a much lower price and with much greater reliability than they could produce on their own, we expect the universal access, 24/7 reliability, and ubiquitous collaboration promised by cloud computing [15].

Now we are currently in the early days of the cloud computing revolution. As Sun Microsystems's slogan is "*The network is the computer*" [39], and that's as good as any to describe how cloud computing works. In essence, a network of computers functions as a single computer to serve data and applications to users over the Internet. The network exists in the cloud of IP addresses that we know as the Internet, offers massive computing power and storage capability, and enables wide scale group collaboration. The definition of the cloud is it's a large group of interconnected computers. These computers can be personal computers or network servers they can be public or private.

2.2.1. The Way of the Future

In traditional desktop the whole scene is PC centric, you run copies of software programs on each computer. The created documents are stored on the computer which they were created, documents can be accessed from other computers on the network, and they can't be accessed by computers outside the network unless you configure this. In cloud computing, the software programs you use aren't run from your personal computer, but are rather stored on servers accessed via the Internet, even if your computer was crashes, the software is still available for you to use, anyone with the right permission can access his documents only, also editing and collaborate with others user's documents in real time, figure 2 illustrate that from traditional desktop applications to cloud applications, your company doesn't pay for hardware and maintenance, the service provider pays for equipment and maintenance [16].

With network computing, applications and documents are hosted on a single company's server and accessed over the company's network, cloud computing isn't network computing, cloud computing is a lot bigger than that, cloud computing encompasses multiple companies, multiple servers, and multiple networks, unlike network computing, cloud services and storage are accessible from anywhere in the world over an Internet connection, with network computing, access is over the company's network only, according to the user perspective the technology and infrastructure behind the cloud is invisible, it isn't apparent and, in most cases doesn't matter whether cloud services are based on HTTP, HTML, XML, JavaScript, or other specific technologies, there are six main properties of cloud computing:

Cloud computing is user centric: Once you a user are connected to the cloud, whatever is stored there documents, messages, images, applications, whatever becomes yours. In addition, not only is the data yours, but you can also share it with others. In effect, any device that accesses your data in the cloud also becomes yours.

Cloud computing is task centric: Instead of focusing on the application and what it can do, the focus is on what you need done and how the application can do it for you, traditional applications word processing, spreadsheets, email, and so on are becoming less important than the documents they create.

Cloud computing is powerful: Connecting hundreds or thousands of computers together in a cloud creates a wealth of computing power impossible with a single desktop PC.

Cloud computing is accessible: Because data is stored in the cloud, users can instantly retrieve more information from multiple repositories. You're not limited to a single source of data, as you are with a desktop PC.

Cloud computing is intelligent: With all the various data stored on the computers in a cloud, data mining and analysis are necessary to access that information in an intelligent manner.

Cloud computing is programmable: Many of the tasks necessary with cloud computing must be automated. For example, to protect the integrity of the data, information stored on a single computer in the cloud must be replicated on other computers in the cloud. If that one computer goes offline, the cloud's programming automatically redistributes that computer's data to a new computer in the cloud.

2.2.2 Cloud Architecture

A massive network of servers or even individual PCs interconnected in a grid is the key of cloud computing, these computers run in parallel, combining the resources of each to generate supercomputing like power. One of the primary benefits of cloud computing is a vast amount of computing power, achieved from relatively low cost PCs and servers. When you tap into the power of the cloud, you get supercomputing power at PC prices.

The collection of computers and servers that is publicly accessible via the Internet creates the cloud. This hardware is typically owned and operated by a third party on a consolidated basis in one or more data center locations. The machines can run any combination of operating systems, it's the processing power of the machines that matter, and not what their desktops look like, cloud architecture is deceptively simple, although it does require some intelligent management to connect all those computers together and assign task processing to multitudes of users.

Virtualization and cloud computing are dovetailed, virtualization is a technique in which a complete installation of one machine is run on another. The result is a system in which all software running on the server is within a virtual machine. Virtualization could be one-to-many or many-to-one, one-to-many enable you to create many virtualized resources from one physical resource. This approach allows you maximize resource utilization. Virtual resources hosting individual applications are mapped to physical resources to provide more efficient server utilization, there are five varieties cloud services, four types of deployment approaches, figure 3 illustrate this concept.

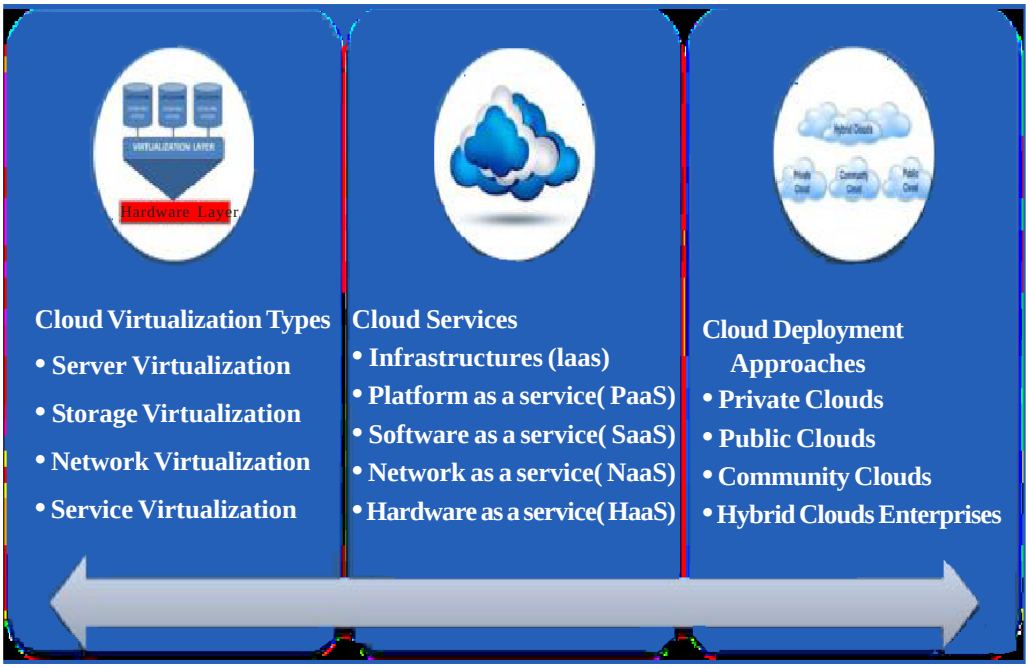

Figure 3. Cloud computing Virtualization, Service and Deployment Approaches

2.2.3 Cloud Service model

When we look ahead to the next decade of cloud computing, we will find that its promises new ways to collaborate everywhere, through mobile devices, most business applications are moving to the cloud. It's not just a fad the shift from traditional software models to the Internet has steadily gained momentum over the last 10 years [17]. You should not move absolutely to the cloud, in fact, there are instances where you should not move to the cloud. But there are also instances when you certainly should add cloud computing to your IT repertoire. There are many different cloud services guises models that would serve you [18].

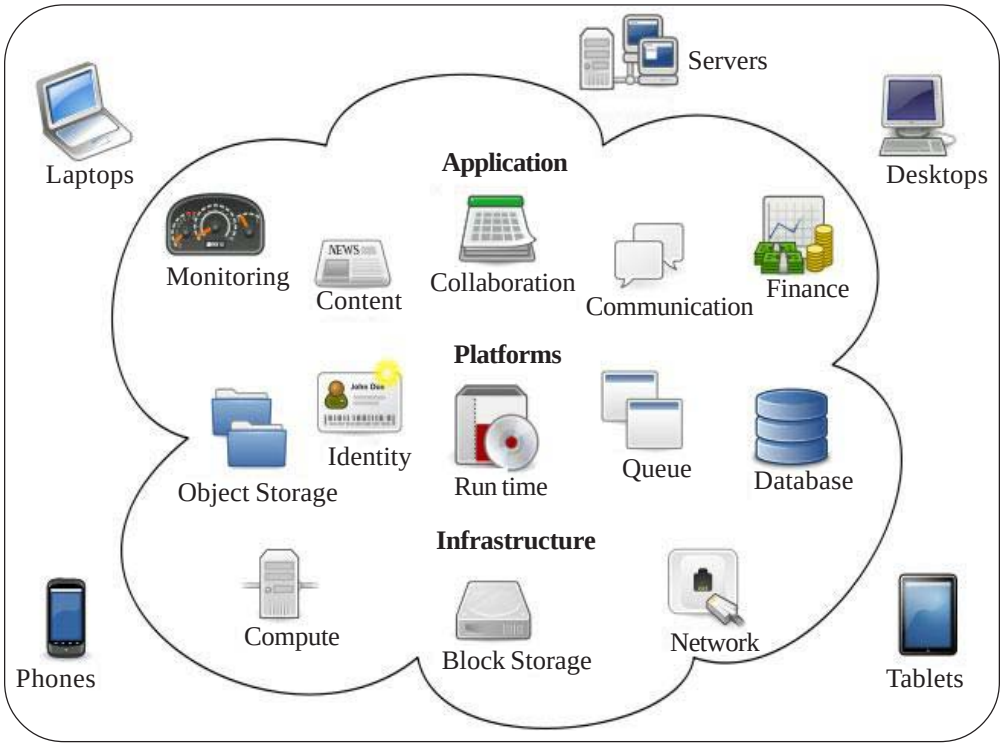

Figure 4. Cloud services model overview

Cloud services are the basic principle behind the emergence of cloud computing, as explained before there are generally and four types of deployment approaches, private clouds, public clouds, community clouds and hybrid clouds. And three main categories of services that can be offered by any cloud architecture and technology [19], such as Infrastructure as a Service (IaaS) which is a concept of providing the whole IT infrastructures such as storage, virtual environment, servers, platforms, and applications. Platform as a Service (PaaS), a concept of providing a complete service level application development environment as a service over the Internet right from requirements to the complete life cycle, and Software as a Service (SaaS), which is a concept of providing software applications as a service on demand over the Internet which means it can be run anywhere and anytime and to pay per use rather than to buy, figure 4 illustrate cloud services model overview.

2.2.4 Community clouds

When sharing infrastructure between several sites and organizations with common issues like security, compliance, etc, you are using a community cloud, which is hosted internally or externally and could be managed internally or by a third party, the cost is spread over fewer users than a public cloud, only some of the cost savings potential of cloud computing are realized. Community cloud is best when you are looking for energy, cost efficiency and vertical applications [20], any software that support specific business processes to targets a smaller number of users within an organization called a vertical application, enterprise resource planning (ERP) or customer relationship management (CRM) is an example for vertical application.

All kinds of underutilized and unutilized compute machines are being networked, clustered, and virtualized to act as community clouds that are capable of effortlessly to tackle specific needs of a particular community. Community cloud offering an alternative architecture for the use cases of cloud computing, the community cloud is not owned or controlled by one organization, and therefore not dependent on the lifespan or failure of any one organization, it's resilient to failure and robust, no system wide cascade failures, because of the diversity of its supporting nodes, community cloud offer control convenience because its community ownership provides for democratic distributed control, community cloud make use of underutilized user machines will require much less energy than the dedicated data centers required for vendor Clouds.

2.2.5 Benefits of Using Cloud Computing

We will explain more about the could computing benefits, one of the most key benefits of using cloud computing, that there are several different ways to deploy the cloud infrastructure, cloud computing is not a one size that fits all affair, you may have a

massive needs to deploy a larger the number of servers, or run in house servers type, alternatively you may only need a sip of processing power, in this case you don't want to buy and run a dedicated server, the cloud will fits all this needs [13], there are some factors that control you when thinking about the using cloud:

- Cost/benefit ratio
- Speed of delivery
- How much capacity you will use
- Whether your data is regulated
- Your organization's corporate and IT structure

2.3 Cloud computing benefits

2.3.1 Scalability

The most important characteristic of using cloud computing is the scalability, which allow you scale up your computer power any time, if you have a high demand to use a huge upswing in computing, you can buy additional CPU cycles or storage from a third party, once you have finished your need of additional resources, simple you could add or remove service based on your organization's need.

2.3.2 Simplicity

Cloud allows you to not buy and configure the hardware or software, so it make it very simply because your needs from hardware or applications will started immediately after you request it, the cost will be a fraction depend on what you need and what you request.

2.3.3 Knowledgeable Vendors

The it world move very fast and every day there a new technology that becomes popular, if you host your application in your house, you have to invest in every update and this will cost you money and effort, by using the cloud computing you will relax and let your third party provider make this for you, the famous cloud providers have good vendors because they have offered reliable service, you will got some brand familiarity and have benefits for plenty of capacity.

2.3.4 More Internal Resources

Using cloud free your IT department from freed up to work on important business related tasks, your service provider will be responsible for critical missions, there is no need to employee more manpower and training that stem from having to deal with these low level tasks, network outages is a nightmare for the IT staff, this will move this burden is offloaded into the service providers.

2.3.5 Security

One of the important issues in any network is the security, there are many plenty of security risks when using a cloud from service providers, but reputable companies strive to keep you safe and secure.

3. Related Work

There were many researches that offer contribution for a mobile web or hybrid mobile web cloud applications, but most of them provide solution for specific points, there were a few contributions that provide a whole solution or complete one for hybrid mobile web cloud applications, if you are thinking about how the combining hybrid web applications, mobile web, portable computing devices, wireless communication, cloud computing, this combination could laid the foundation for a novel computing model which could be called hybrid mobile web cloud applications, research has not given the required attention to the development of mobile web content over cloud computing model.

Here we will discuss some approaches and their drawbacks. The first approach is an elastic web server farm for cloud based on Hadoop [21], using cloud serving infrastructures to host a web application to providing application level scalability, demonstrates its ability to run in isolation different web applications and scale dynamically on a cluster of machines, to run web applications that acquire and pre-process high frequency web feeds such as breaking news and finance quotes, the drawback was it solve

the complicated nature and operational overhead of bootstrapping only, scalability for processing and storage only, but the application size remain as it.

The content delivery network system based on cloud storage [22], cloud storage service has recently emerged to provide content storage and delivery capabilities. Cloud storage adopting distributed storage technology and the cache technology, the system provided by telecom operators has mirror servers across the country and can automatically determine the most suitable route between the mirror server and the WAP service users, this model provide storage only, and no integration between application server and storage server. A cloud service environment framework for SCORM compatible content [23], it offer deeply influenced e-learning area, it's a proposal for cloud service environment framework and its service mode compatible content, it realizes content's unified storage and the freely sharing of learning content and record for outside applications, which breaks traditional SCORM compatible LMS's limitations and reduces storage and management cost of SCORM compatible content.

And for hybrid web cloud applications there were some approaches were interested in web mashup and its tools [8], mashup composition tools are at the core of emerging software engineering paradigm, benchmarking is a promising approach providing a strong evaluation mechanism based on quantitative and reproducible measurements, the goal here is to delimit the scope and discuss the feasibility of a unified benchmarking framework targeted for Web-based mashup tools. An efficient mashup tool for searching and fusing web entities [24] this demonstrate a new mashup tool to search and integrate web data from diverse sources and domain specific, it supports adaptive query sets of relevant entities with a communication overhead, it implementation supports a high degree of parallel processing, in particular a streaming of entities between all data transformation operations facilitating a fast presentation of intermediate results.

Last approach is for mobile mashup application [25], it describes a mobile web application that allows browsing conference publications, it queries a main endpoint that serves the conference metadata set, it can be linked to external web services, it follows recent W3C technical advances and as a mashup, requires few server resources, but it was much tied to specific application type and not large enough to be considered as a framework or architecture. Our proposed new architecture model will try to avoid the problems that face the previous approaches, and try to take advantage of the others [9], to provide a very unique contribution for hybrid mobile web cloud applications that and provide a lightweight for mobile web content access over enterprise cloud model.

4. Features of the Proposed Architecture

Using of cloud computing with hybrid mobile web will extend our model to provide a faster mobile web access, more scalability, instant computational power when need and will save time, effort and money, our architecture will provide:

- Best web service provide % 99.9 uptime our model will provide %100 uptime.
- Separation between system kernel, logic and interface will make administrative tasks more easer.
- Create new innovative rules for hybrid mobile web cloud content.
- Extended cache system.
- Provide technique for better resources access.
- Simple, faster and easy web content creation.
- Simple, faster and easy web content access.
- Better and interactive custom experience.
- Smart technique for heterogeneous systems treatments.
- New era of web contents technology.

5. New Architecture Design

This combination of cloud computing, smart mobile devices, context enablement, content enhancement, and mobile mashup introduces a new archetype for hybrid mobile web cloud content architecture. We try to find a novel architecture solution that provides enterprise mobile web platform architecture with an optimization enhancement for network data transfer. Our new

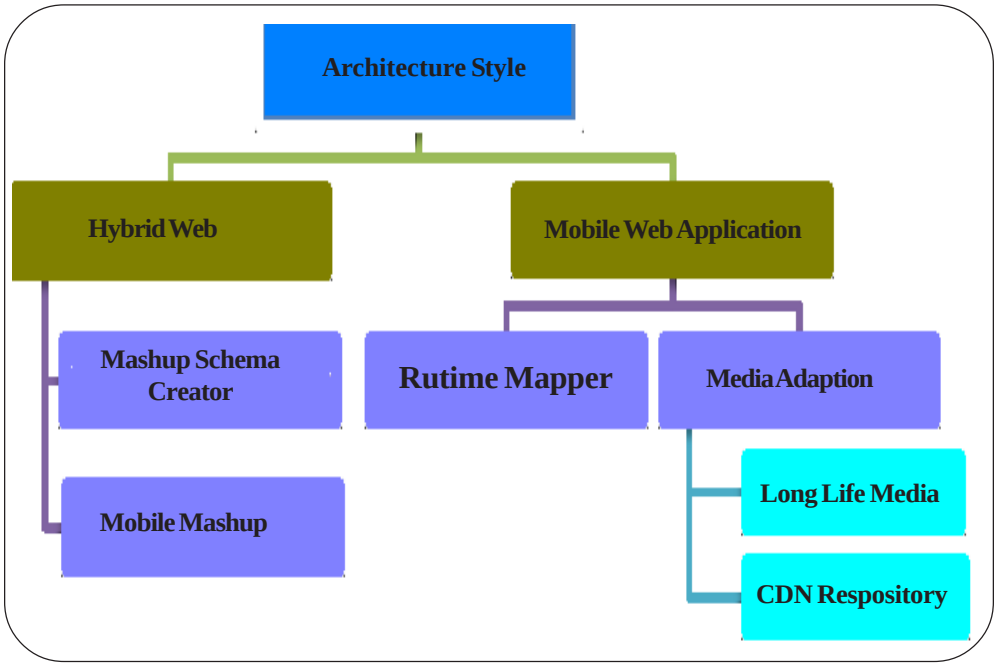

Figure 5. Overview of the Architecture Proposed Design

architecture style will enable scalability, instant computing power, saving for time and administration effort, also recourses access we will have a new smart technique for optimized access over http protocol, separation between system kernels, logic and interface will enter our architecture to the new era that best matching cloud computing technology.

CMS application now needed to be split in loosely coupled modules that will interacted with each others, traditional web content or mobile web content today is based on creating, develop or use a new CMS application, this is done mostly using some popular CMS applications to manage this content, today there are much free and open source CMS to use like Joomla, WordPress, Drupal or ExpressionEngine, the proposed architecture is based on two main directions, the first is hybrid cloud web content, and the second is mobile web content enhancement, this two directions is the core of architecture style implementation, figure 5 illustrate the architecture proposed design.

6. Architecture model definition

Our main contribution is to facilitate the process creating, developing and using of hybrid mobile web cloud content, through shifting the computation between traditional servers that will host the web content graphical user interface (GUI) template and database that contain current web content and configurations, and cloud main server, the architecture style cloud section has two main components, server component and cloud component, as explain in figure 6 that illustrate cloud and server components distribution, the CMS kernel will be hosted in the main cloud server, each web content presentation layer (PL) in addition to its database, will be hosted under the traditional web server, each PL with its database produce a version for web content for current web content, each GUI has a template sets that produce different content design interface for some current used design.

This is defining formal notation for different web content sets, with its PL and GUI template set:

$$A = \{a_1, a_2, a_3, \dots, a_n\}, P\{p_1, p_2, p_3, \dots, p_n\}, \text{and } T\{t_1, t_2, t_3, \dots, t_n\}\ P \subseteq A\ \&\ T \subseteq A$$

A is a set that contain different dynamic web content (DWEC), which is running under different traditional web servers, that uses the same CMS kernel over the main cloud server, *P* is a set of presentation layer interface and its database content, *T* is a set of template set, such that *P* is a proper subset of *A* and *T* is also a proper subset of *A*.

This defining formal notation for dynamic web content that uses same kernel over some cloud servers:

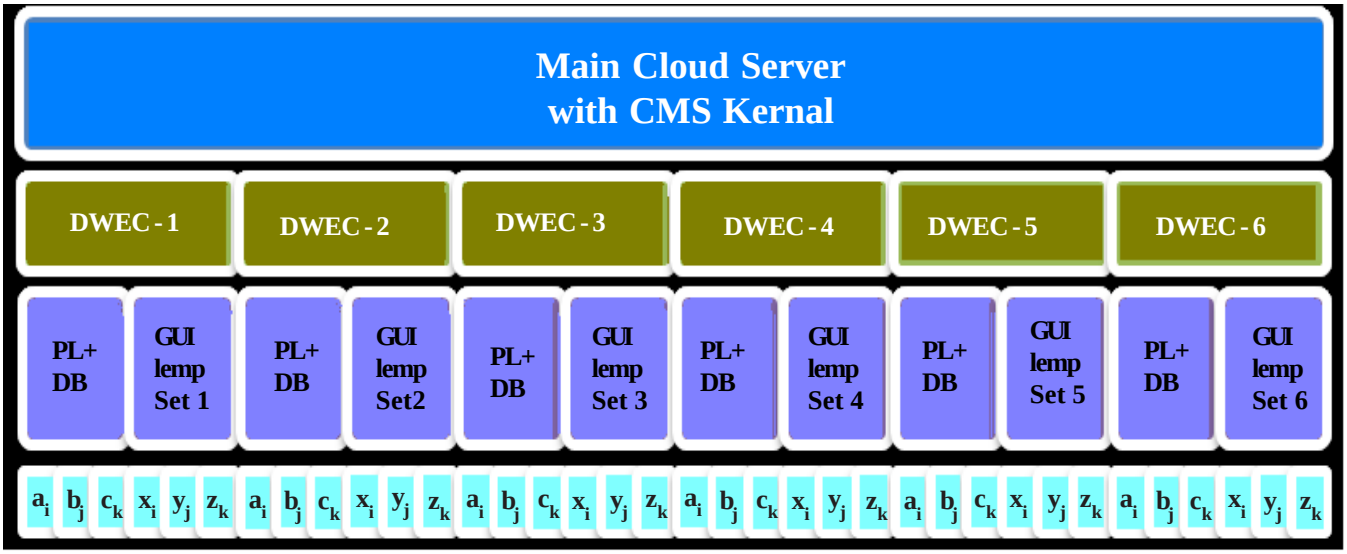

Figure 6. Cloud and server components distribution model

$$\exists\, p, t \text{ s.t. } \forall\, \mathrm{d} \in D \mid D = \{d_1, d_2, d_3, \ldots, d_n\}$$

Where D is all dynamic web content that hosted over traditional web server and use the same kernel from this main cloud server, p is the current presentation layer with for some current of database version, and t is the GUI with a its current template.

In next section we will explain more about how architecture style request-response scenario, but now we have to define the formal notation for runtime mapper and optimizer that will help any web content to run faster and provide a better resources specially for mobile devices, the architecture is based on creating new custom rules, for enhancing mobile web content accessing that will run over the cloud computing systems, based on distributing the processing and resources, template engine will run with mashup in a new sequence , this will optimize the data transfer size to provide us with a new mobile content web browsing model, we will get an enhancement for the performance, good response time, this give us more scalability option and add instant power to the model, there will be some type of caching that will enhance next client request and help us more in distributing web content over edge servers.

This defining formal notation for current running web content with its cached versions under cloud and edge servers:

CR = $\{cr_i \in \mathrm{CR} \mid cri = \text{current web content for some version}\}$, where CR = $\{cr_1, cr_2, \ldots, cr_n\}$

CR is the current content for some version that will be available over current traditional server.

CR = $\{cr_1, cr_2, \ldots, cr_n\}\ \forall cr_i \cap cr_j = \varnothing,\ i, j = 1, 2, 3 \ldots n$

CV = $\{cv_i \in \mathrm{CV} \mid cv_i = \text{cached version under edge server for current content}\}$, where CV = $\{cv_1, cv_2, \ldots, cv_n\}$

CV is the current cashed version for some current web content that will be available over current traditional server.

CV = $\{cv_1, cv_2, \ldots, cv_n\}\ \forall\ cv_i \cap cv_j \neq \varnothing, \forall\ i, j = 1, 2, 3 \ldots n$, where CV $\subseteq$ CR

Where CR is the current version for main web content under the traditional server, and CV is cached version under edge server or cloud server for the same content CR. Also we will offer a special enhancement for data size transfer for mobile web users. The proposed architecture came to solve many problems that are associated with the natural of the mobile web content creation and developments, and because that is most web content today is based on using CMS applications, we choose this type of technology for implementing the new architecture for mobile mashup cloud computing.

7. Conclusion and Future Work

Mobile cloud computing includes an amazing wealth of ideas, for new hot products, for high quality market research and

analysis by academic experts, in this paper we try to find a architecture solution that provide an enterprise web platform architecture with a very optimized network data transfer. Our new architecture style will enable scalability, instant computing power, saving for time and administration effort, also recourses access we will have a new smart technique for optimized access over http protocol, separation between system kernels, logic and interface will enter our architecture to the new era that best matching cloud computing technology.

New architecture take mobile web applications to the next level, by using the new architecture, your mobile web application can be developed, deploy, managed, administer or published easier and faster than previous, using mashup, cloud computing and new smart techniques from web technology, With the proposed architecture, the mobile web content will run faster and simpler than before, with new enhanced feature and enjoy with a new benefits.

In the near future, we plan to work more in architecture implementation and add more measures for usability of our proposed architecture against real customer needs. We also plan to test the architecture on a number of different smart-phones and cellular networks.

References

[1] Mobile Cloud Computing. (2011). A Comparison of Application Models, Dejan Kovachev, Yiwei Cao and Ralf Klamma.

[2] Cisco Visual Networking Index. (2013). Global Mobile Data Traffic Forecast Update, p. 2012–2017, White Paper.

[3] Mobile Web Watch. (2012). The fifth edition of the Accenture Mobile Web Watch survey, White Paper.

[4] Mobile Web on the Desktop. (2011). Simpler Web Browsing, Jeffery Hoehl, Clayton Lewis, Coleman Institute for Cognitive Disabilities.

[5] http://mobiforge.com/book/the-benefits-mobile-web, retrieved on 2013.

[6] http://en.wikipedia.org/wiki/Mashup_%28web _application_hybrid%29#Types_of_mashup, retrieved on 2013.

[7] Distributed System, Concepts and Design, Fifth Edition. (2013). George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair.

[8] Towards A Unified Benchmarking Framework for Web-based Mashup Tools. (2012). Saeed Aghaee, Cesare Pautasso.

[9] A Smart Framework for Web Content and Resources Adaptation in Mobile Devices. (2009). Shawkat K. Guirguis, Mohamed A. Hassan.

[10] Beginning Mobile Application Development in the Cloud. (2012). Richard Rodger.

[11] Cloud Computing: Automating the Virtualized Data Center. (2012). Venkata Josyula, Malcolm Orr, Greg Page.

[12] http://en.wikipedia.org/wiki/Virtualization, retrieved on 2013.

[13] http://www.forbes.com/sites/joemckendrick/2013/07/ 21/5-benefits-of-cloud-computing-you-arent-likely-to-see-in-a-sales-brochure/, retrieved on 2013.

[14] Socially-Enriched semantic mashup of web APIs. (2012). Jooik Jung, Kyong-Ho Lee.

[15] Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online. (2009). Michael Mille.

[16] Cloud Computing: A Practical Approach. (2010). Anthony T. Velte, Toby J. Velte, Ph.D., Robert Elsenpeter.

[17] http://searchcloudprovider.techtarget.com/definition/ cloud-services, retrieved on 2013.

[18] http://www.ibm.com/developerworks/cloud/library/cl-cloudservicemodels/?cmp =dw&cpb=dwcld&ct= dwnew&cr= dwnen&ccy= zz&csr=021011, retrieved on 2013.

[19] http://www.oracle.com/us/solutions/cloud/ infrastructure overview/index.html, retrieved on 2013.

[20] http://www.webopedia.com/TERM/V/vertical_ application.html, retrieved on 2013.

[21] An Elastic Web Server Farm for Cloud Based on Hadoop. (2010). Krishnan S., Counio J.C.

[22] The Content Delivery Network System Based on Cloud Storage. (2011). Yuedui Wang; Xiangming Wen, Yong Sun, Zhenmin Zhao, Tianpu Yang.

[23] A Cloud Service Environment Framework for SCORM Compatible Content. (2011). Wen Huang, Yi-Xia Zhao, Yun Xiao, Xing-Hua Sun.

[24] An Efficient Mashup Tool for Searching and Fusing Web Entities. (2012). Stefan Endrullis, Andreas Thor, Erhard Rahm.

[25] DataConf: Enriching Conference Publications with a Mobile Mashup Application. (2013). Lionel Médini, Florian Bâcle, Nguyen Hoang Duy Tan.