Volume 4, Issue 8, August 2014 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Survey of Cloud Computing in Smartphones Cloud Computing Architectures

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Abstract—cloud computing in smartphones is the combination of smartphones and cloud computing based web services. It is used for information and applications without the need of complex and costly hardware and software. In this paper there is discussion on architectures of cloud computing and also the challenges occurred in those.

Index Terms—API, RESTful, SOA, symmetric and asymmetric cryptography, Mediation framework, Mediation Architecture, Web Services, Heterogeneity.

I. INTRODUCTION

Cloud computing is the next stage in the evolution of Internet's and web 2.0. Cloud computing provides the means through which everything, from computing power to computing communications, applications, business processes even personal association. A Cloud can be delivered as a service wherever and whenever needed.

The "cloud" in cloud computing can be defined as the set of hardware, networks, storage, services, and interfaces that combine to deliver aspects of computing as a service. Cloud services include the delivery of software, infrastructure, and storage over the Internet based on user demand. Cloud computing has four essential characteristics: elasticity and the ability to scale up and down, self-service provisioning and automatic DE provisioning, application programming interfaces (APIs), billing and metering of service usage in a pay as you use model [1]. Figure 1.4 below shows a typical cloud platform on the web. This flexibility is what is attracting individuals and businesses to move to the cloud. Following are the few advantages of having an application hosted on the cloud:

- The end user who doesn't have to know anything about the underlying technology.
- Business management who needs to take responsibility for the governance of data or services living in a cloud.
- Cloud service providers must provide a predictable and guaranteed service level and security to all their constituents.
- The cloud service provider who is responsible for IT assets and maintenance.

Cloud computing can completely change the way companies use technology to service customers, partners, and suppliers. Some businesses, such as Google and Amazon, already have most of their IT resources in the cloud. They have found that it can eliminate many of the complex constraints from the traditional computing environment, including space, time, power, and cost [2].

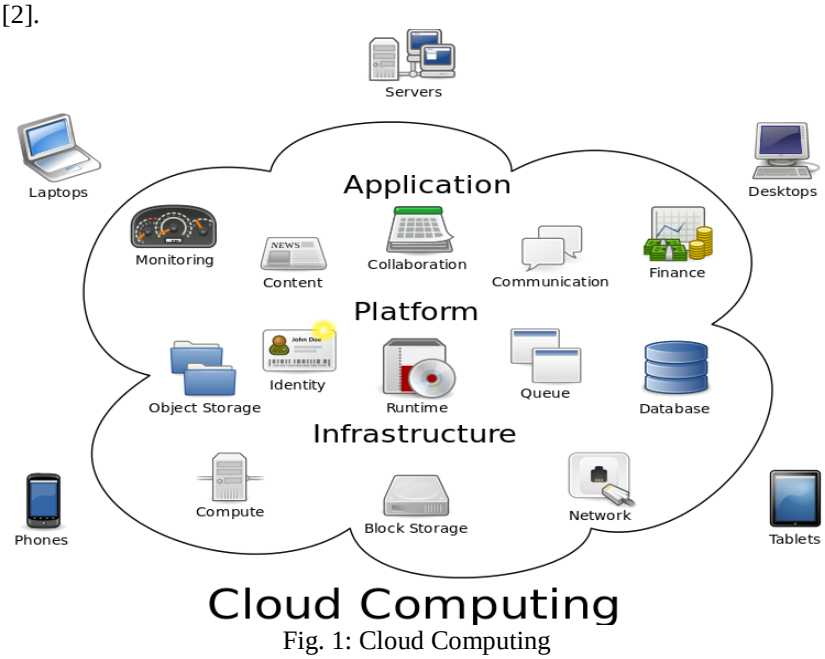

Fig. 1: Cloud Computing

A simple example of cloud computing is Emails and Online Storage Options. Through the availability of internet connection one can start sending emails. The server and email management software is all on the cloud and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. Cloud computing is broken down into three segments: "application" "storage" and "connectivity." Each section serves a different purpose and offers different products for businesses and individuals around the world.

II. SERVICE-ORIENTED ARCHITECTURE (SOA)

It is a software design methodology based on structured collections of discrete software modules, known as services that collectively provide the complete functionality of a large or complex software application. Each service that makes up an SOA application is designed to provide a tightly defined set of functions. As a result, each service is built as a discrete piece of code. This makes it possible to reuse the code in different ways throughout the application by changing only the way an individual service interoperates with other services that make up the application, versus making code changes to the service itself. SOA design principles are used during software development and integration.

III. WEB SERVICES

Web Services is a technology linked to the idea of Service Oriented Computing (SOA) [3]. A Web Service is "A software system designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format (e.g. WSDL). Other systems interact with the WS in a manner prescribed by its description using messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-elated standards."[4]

There are two WS protocols standards, SOAP WS and RESTful WS. Figure 1.2 below shows SOAP WS in a service-oriented architecture. SOAP WS have well-adopted standards.

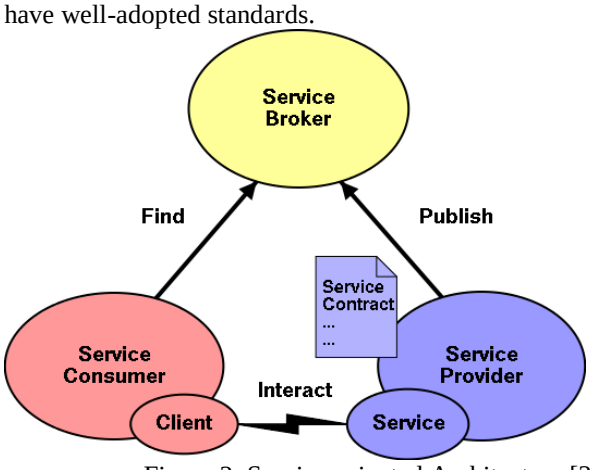

Figure 2: Service-oriented Architecture [3]

Following are the steps of consuming SOAP WS:

A. Service providers publish services to the service registry following the UDDI standard.
B. Clients also follow UDDI to discover the service they need.
C. Clients generate code for a specific SOAP WS from the WSDL.
D. Clients exchange SOAP messages with the service using the HTTP protocol.

An alternative to SOAP WS are RESTful WS, They follow a resource-oriented computing paradigm. RESTful WS are presented as resources which are identified by a Uniform Resource Identifier (URI). Clients communicate with RESTful WS through the HTTP protocol, but the message body can follow any formats, for example XML and JSON, as long as the clients and the service providers agree upon it. RESTful WS also take advantage of the semantics of the HTTP protocol. For example, HTTP GET request is for acquiring a resource and HTTP POST request is for creating a resource. URL query, HTTP header, and request body can all be used as service inputs

IV. REVIEW

Main challenges of mobile computing are connections problems, bandwidth, heterogeneous networks and bottleneck issues. With the advent of the Internet and the plurality and variety of fancy applications it brought with it, the demand for more advanced services on cellular phones is increasingly becoming urgent. Unfortunately, so far the introduction of new enabling technologies did not succeed in boosting new services. The adoption of Internet services has shown to be more difficult due to the difference between the Internet and the mobile telecommunication system. Many examined the characteristics of the mobile system and to clarify the constraints that are imposed on existing mobile services. Authors also investigated successively the enabling technologies and the improvements they brought. The analysis of current mobile service architecture such as voice communication, supplementary services with intelligent network, enabling services on SIM with SIM application tool kit, text services with short message service, internet services with WAP and dynamic applications on mobile phones with J2ME are explained in this research. Research also suggests the challenges of mobile computing which includes harsh communications, connections, bandwidth and heterogeneous networks.

Al-Turkistany et al. (2010) "*Adaptive wireless thin-client model for mobile computing****"*** presented that the processing overhead of WS mainly comes from the usage of XML (about 400% compared to binary protocols). It is an approach to improve performance with dynamic compressing of the WS response. In his approach, whether or not to apply compressing depends on the server load and the client network load. The thin-client computing ideal has the possible to considerably rise the presentation of mobile computing environments. By carrying each request across a solitary, small-footprint client requested on a mobile mechanism, it is probable to optimize request presentation lacking the demand for constructing wireless request gateways. Two momentous contributions in the span of wireless thin-client computing are as follows. Firstly, a mathematical presentation ideal is derived for wireless thin-client system. This ideal identifies factors that alter the presentation of the arrangement, and supports derivation and scrutiny of adaptation strategies to uphold a user-specified quality of ability (QoS). Secondly, a proxy-based adaptation framework is industrialized for wireless thin-client arrangements, that vibrantly optimize presentation of a wireless slender client via vibrantly discovered context. This is requested alongside rule-based furry logic that replies to variations in wireless link bandwidth and client processing power. Our furry inference engine uses contextual data to vibrantly optimize tradeoffs amid disparate quality of ability parameters presented to conclude users.

Kumar, Y., Munjal et al.(2011) "*Comparison of Symmetric and Asymmetric Cryptography with existing vulnerabilities and counter measures****"*** highlighted how security explains how security plays an important role in terms of having a secure communication between the middleware and smartphone and also between the middleware and cloud. Encryption algorithm plays a crucial role in information security which guarantees the recent growing internet and network applications. They are used to secure the data in wireless networks against malicious attacks but securing data also consumes resources such as C.P.U time, Memory, battery power, encryption time etc. Research evaluates the performance of four symmetric key encryption algorithms; AES, DES, 3DES and Blowfish which commonly used for data encryption in terms of encryption time, decryption time& throughput. In this research, encryption time, decryption time and throughput for all four encryption algorithms using large size text data has been evaluated. his research has shown that many cryptographic techniques can be applied on the wireless. Study reveals that Blowfish, AES, DES and 3DES can be used for encryption and decryption of wireless networks.

Ragunathan, P. (2008) "*Accessing a Network using a Secure Android Application****"*** presented protection subjects like sniffing of data as accessing data across open channel. Proper protection measures can aid to deal alongside the public protection menaces confronted by mobile phone users such as data protection, privacy, request and confidential data security. Cryptographic methods frolic a vital act in protecting contact links and data, as admission to data can be manipulated to those who grasp the proper key. In his scrutiny paper, he debates a method to securely admission data in a web by an android mobile request employing AES cryptographic technique. The paper describes a new key allocating algorithm, established on the symmetric key association, for faster and effectual encryption of data that is suitable for use in a mobile device. There are supplementary encryption algorithms both symmetric and asymmetric algorithms that can be contrasted and utilized in a wireless web that can be utilized for enhancing security. RJSON converts each JSON data collection into extra compact recursive form. Compressed data is yet JSON and can be parsed alongside JSON parse. RJSON can compress not merely homogeneous collections, but additionally each data sets alongside free structure. RJSON is single-pass stream compressor, it extracts data schemes from document, assign each schema unique number and use this number instead of repeating same property names again and again. The RJSON data is more compressed than the JSON as it used the recursive form of JSON.

Oliver, E. (2009) "*A survey of platforms for mobile networks research****"*** evaluated how well the current mobile platforms including Android, BlackBerry, iPhone, Symbian (S60), and Windows Mobile, support the concept of mobile network based research, for example, mobile service clients. According to the survey, all of these mobile platforms have certain limitations. For example, Android 1.0 lacks Bluetooth stacks and the ability to select network interfaces programmatically, which is fixed in Android 2.0. The iPhone framework lacks openness. The use of smartphones is growing at an unprecedented rate and is projected to soon pass laptops as consumers' mobile platform of choice. The proliferation of these devices has created new opportunities for mobile researchers; however, when faced with hundreds of devices across nearly a dozen development platforms, selecting the ideal platform is often met with unanswered questions. Android operating System has a great potential in research related to wireless communication. Being an open source and a big database bank of in build libraries it is ideal for use in research work.

Iosup, A. et al. (2011) "*Performance analysis of cloud computing services for many-tasks scientific computing****"*** explained Cloud computing is an emerging commercial infrastructure paradigm that promises to eliminate the need for maintaining expensive computing facilities by companies and institutes like. Through the use of virtualization and resource time-sharing, clouds serve with a single set of physical resources a large user base with different needs. Thus, clouds have the potential to provide to their owners the benefits of an economy of scale and, at the same time, become an alternative for scientist clusters, grids, and parallel production environments. However, the current commercial clouds have been built to support web and small database workloads, which are very different from typical scientific computing workloads. Moreover, the use of virtualization and resource time-sharing may introduce significant performance penalties for the demanding scientific computing workloads. In this work the performance of cloud computing services for scientific computing workloads is analyzed.

V. CONCLUSION

Consuming WS from a smartphone is different compared to the standard WS scenarios due to the following factors:

- Mobile devices have limited resources in terms of CPU power and screen size.
- The communication in smartphone is established through wireless network.
- Existing services in the cloud are not supported in Smartphone.

There are several problems while accessing Web Services through smartphones Figure 3.1 above shows how a smartphone consuming a web service on a cloud. The following are the main focus of this work.

A. Loss of Connection Problem

Since the smart phone based devices are not stable and due to the mobility of the smart phones and the wireless network setup, smartphones can be temporarily removed from the previous connected network and later may join network.

B. Bandwidth/Latency Problem

Cell networks have a very limited bandwidth and are often billed based on the amount of data transferred. However, even a simple SOAP message often contains a large chunk of XML data, which consumes a lot of bandwidth and the transmission can cause major network latency. In addition, the SOAP message contains mostly XML tags that are not all necessary for mobile clients.

C. Limited Resources Problem

Smartphone clients are normally "thin clients" with a less processing power. They also have limited screen size and computational power. These shortcomings are only due to mobility.

D. Security Problem

Since these devices actually use the wireless networks which is much vulnerable and data can easy be hacked and devices compromised.

ACKNOWLEDGMENT

The authors are very thankful to the management of ACET, Punjab for their guidance and support. We are also thankful to CSE department of ACET, Punjab for their invaluable detailed advices on grammar, organization, and the theme o the paper. Last but not the least we are greatly indebted to our family and friends who always encouraged us to attain our goal.

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