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An Improved Internet Design for Effective Network Services

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ABSTRACT
The rapid growth and development of the internet over last few decades have proven that it is difficult to integrate new functionality in order to fulfill the demands of new applications and the capabilities of new transport technologies; more specially the core mechanisms (TCP/IP) which are hard to change. This is what provoked this study which analyzed the current architecture and performance of the internet with emphasis on Domain Name System (DNS), routing system vulnerabilities and architectural complexity that have impacted on the performance of the Internet. The scholars have therefore proposed a service-oriented internet architecture which eliminates the limitation of the existing system.
Keywords: Internet, Domain Name System, routing system vulnerability, Service-Oriented, Architecture.

INTRODUCTION

In the world today, one major innovation that has contributed in terms of globalization and technology is the internet. The internet is an interconnected network of networks on a global scale which makes it possible for computer all over the world to send and receive messages and other information (National Open University, 2010). It is a global collection of computers and networks that connects millions of peoples, organizations military and government to a wide range of information resources.

Since the emergence of internet, it has become the most important medium for information exchange and the core communication environment for business relations as well as for social interactions. Hence, it is used by millions of people all over the world for finding, accessing and exchanging information, enjoying multimedia communications, taking advantage of advanced software services, buying and selling, keeping in touch with family and friends, among others.

It is worthy of note that the superlative success of the Internet has created even higher expectations for new applications and services, which the current Internet may not be able to support to a satisfactory and sufficient level (Ethan & Andrew, 2003). These scholars further asserted that it is expected that the number of nodes (computers, terminals mobile devices, sensors, among others) of the Internet will soon grow to more than 100 billion.

Driven by the demands of ever emerging applications and the capabilities of new communication networks, the Internet has become an architectural patchwork resulting in increasing complexity and unpredictable vulnerabilities. This patchwork is the result of layer violations (cross-layer design), sub-layer proliferation (MPLS at layer 2.5, IPsec at layer 3.5, and TLS at layer 4.5), and erosion of the end-to-end model (middle-boxes, such as firewalls, NATs, proxies, caches, etc.). This erosion of the formerly clearly layered architecture is not just because of too much functionality, but because of lots of implicit dependencies and tight coupling. Under these circumstances, all changes result in a rise of complexity which finally lead to an ossified Internet (Akari, 2008)

However, the problems mentioned above are not related to specific protocols or mechanisms of the current Internet but are mainly caused by the inability to integrate new mechanisms (Akari, 2008). It has

also been observed that the internet patchwork has opened loopholes that hackers have been exploiting. These challenges are caused by the inflexible architectural design of the current Internet and thus could be solved by a new designed architecture that allows for flexible expansion that eliminates the makeshift design. With the great importance of internet in the World, it is expedient for it to function optimally, therefore, there is supposed to be an update in terms of its design. Basically, this research was designed to highlight the improved internet designs.

Review of Related Literature

Internet as an evolving technology, its enormous importance as a result of the huge interest and wider applications has propelled several researchers and scholars to carry out numerous works on it. This is majorly geared towards improving its services in terms of efficiency, effectiveness, reliability, affordability as well as other parameters. However, the internet has been noted to have some lapses which a time makes it almost impossible for users to have effective network service.

DNS and routing system vulnerabilities

All users of the Internet depend on the Domain Name System (DNS), which is needed to translate the cryptic Web page names into the even more cryptic numeric codes that computers actually use. In this regard the DNS works something like a universal telephone directory which, when given a name, will return the corresponding number (in this case an Internet address). Using this numeric code, the Internet's routing mechanism is able to determine where in the world the desired Webpage actually resides and begin the process of retrieving its contents (Koponen, Chawla, Chun, Ermolinskiy, Kim, Shenker, & Stoica, 2007).

Normally this process works perfectly well. However, Steven Bellovin, Blaze's colleague and co-author of Fire walls and Internet Security pointed out that the DNS is weak because it is centralized. Also, the routing system is weak because it is decentralized. In other words, the hierarchical structure of the DNS makes it possible for an attack in one critical area to cripple all its subordinates. On the other hand, the routing system is vulnerable because of its reliance on peers. If one of those peers is corrupted, the problem could spread like a disease throughout the entire back bone of the network. Without these two indispensable components (DNS and the routing system) operating as they should, the Internet would come to a screeching halt.

Analysis of the current internet architectural approach and performance

Architecture, according to Ethan and Andrew (2003) is the fundamental organization of a system, the relationship of components as well as the design and evolution principles. Since the creation of the internet, it is driven by a small set of fundamental design principles rather than a formal architecture that is created on a whiteboard by a standardization or research group. Moreover, the necessity for backwards compatibility and the trade-off between Internet redesign and proposing extensions, enhancements and re-engineering of today's Internet protocols are seriously debated. Because of this lack of initial formal architectural design, its expansion is a patchwork of new communication networks with a complex architecture that is porous and vulnerable. Complex systems are generally less reliable and flexible. Architectural complexity dictates that in order to increase the reliability it is mandatory to minimize the number of components in a service delivery path (being a protocol, software, or a physical path) (Clark, Wroclawski, Sollins & Braden, 2005).

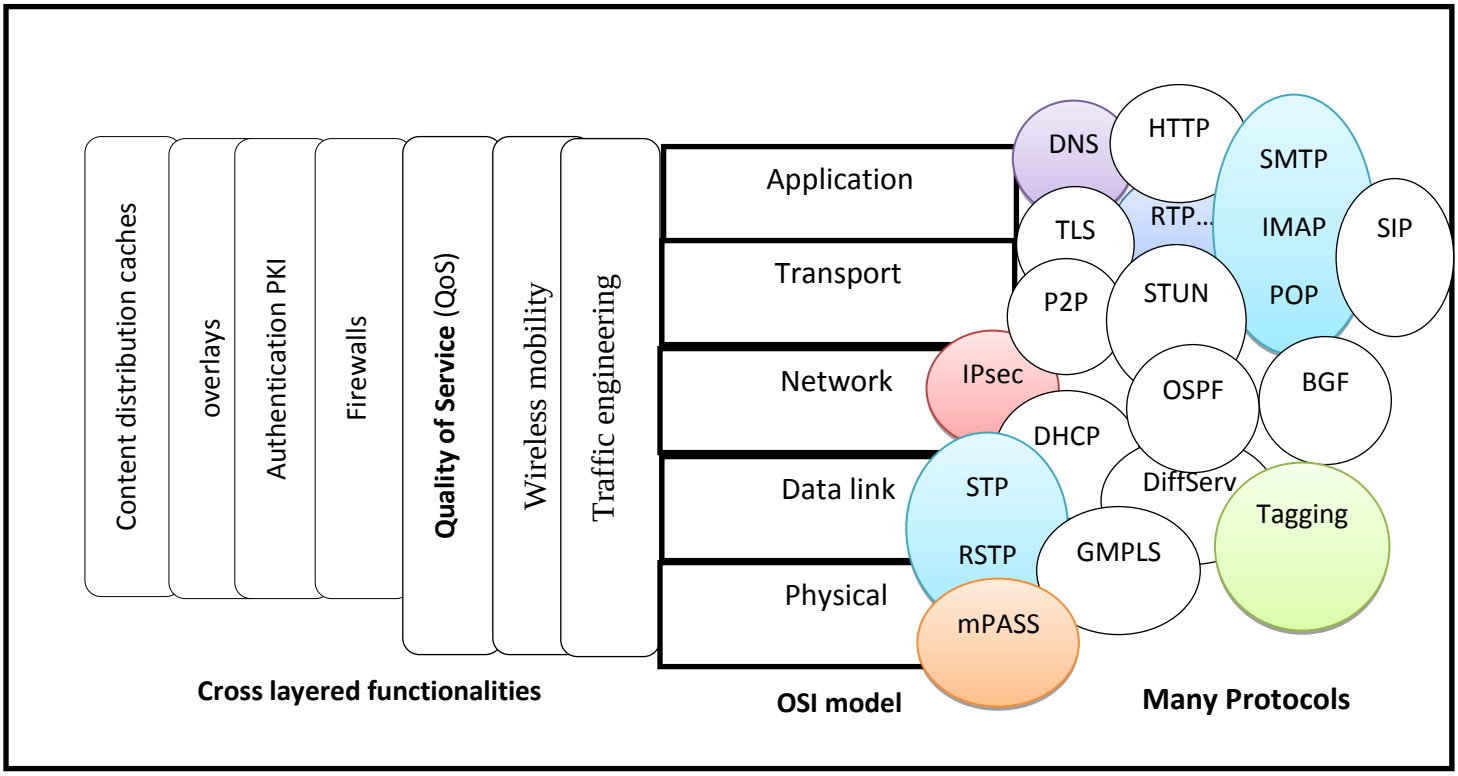

Figure 1: the current Collaged internet Architecture

Architectural complexity

Currently, the Internet has vast developments and modern technologies which can easily be deployed based on networking standards. This leads to a huge community of digital society that is accessible at any time and from anywhere. The Internet has grown up rapidly and supports variety of applications that includes web services; broadcasting multimedia, database accessing, entertainments, real-time Audiovisual Communications (AVC), computer-to-computer communication, among others. This traditional network architecture has distributed control and the elements used for the particular complex design is manned by its own firmware installed in their storage space. However, in spite of this well-developed approach, traditional IP-based networks are still complex and are somehow difficult to manage (Benson, Akella & Maltz, 2009).

In order to deploy any desire network policies in bounded network architecture, because of its distributed nature, a network administrator requires configuring each individual network devices separately. This will be time consuming and may lead to increase complexity or may introduce faults due to reconfiguration of individual hardware or due to load unbalance. The challenging task for network architecture is that the network requires being dynamic in nature and can be controlled automatically without involvement of manual operator (Kreutz, Ramos, Verissimo, Rothenberg, Azodolmolky & Uhlig, 2015). This type of automatic reconfiguration of hardware and management task is deficient in traditional IP-based network. Moreover, in traditional network the core networking devices are vertically integrated. The controlling element to handle network traffic and the element to forward network traffic, in form of digital packets as directed by control element, is bundled inside a common networking device. This in turn reduces flexibility in designing related matter and makes it to endure as a static architecture. Thus, it can ultimately confine innovative ideas related to evolution and deployment of bounded infrastructure network.

Proposed novel internet architecture with enhanced performance

This approach looked at internet as a service ecosystem, with the current trend in cloud computing that promotes services through the internet without managing the hardware involved, the internet is becoming more service oriented. To fully support this paradigm shift, the internet Architecture requires design principles that go well beyond the networking and primitive services dimensions. This architecture used harmonized generic protocol unlike the traditional architecture that allows for too many protocols with their different disadvantages.

Additionally, the Internet has evolved to a playground for different stakeholders such as Internet Service Providers (ISPs), Content Distribution Network (CDN) providers, end-users, etc. and each stakeholder tries to optimize its own utilities (or more generally benefits), e.g., ISPs to reduce inter-domain costs, CDNs to improve content routing which make it possible for users to benefit from different choices. The so-called information asymmetry between different stakeholders often leads the ecosystem to a suboptimal performance (Clark, Wroclawski, Sollins &Braden, 2005). This is what the Harmonized Generic Protocol (HGP) has eliminated.

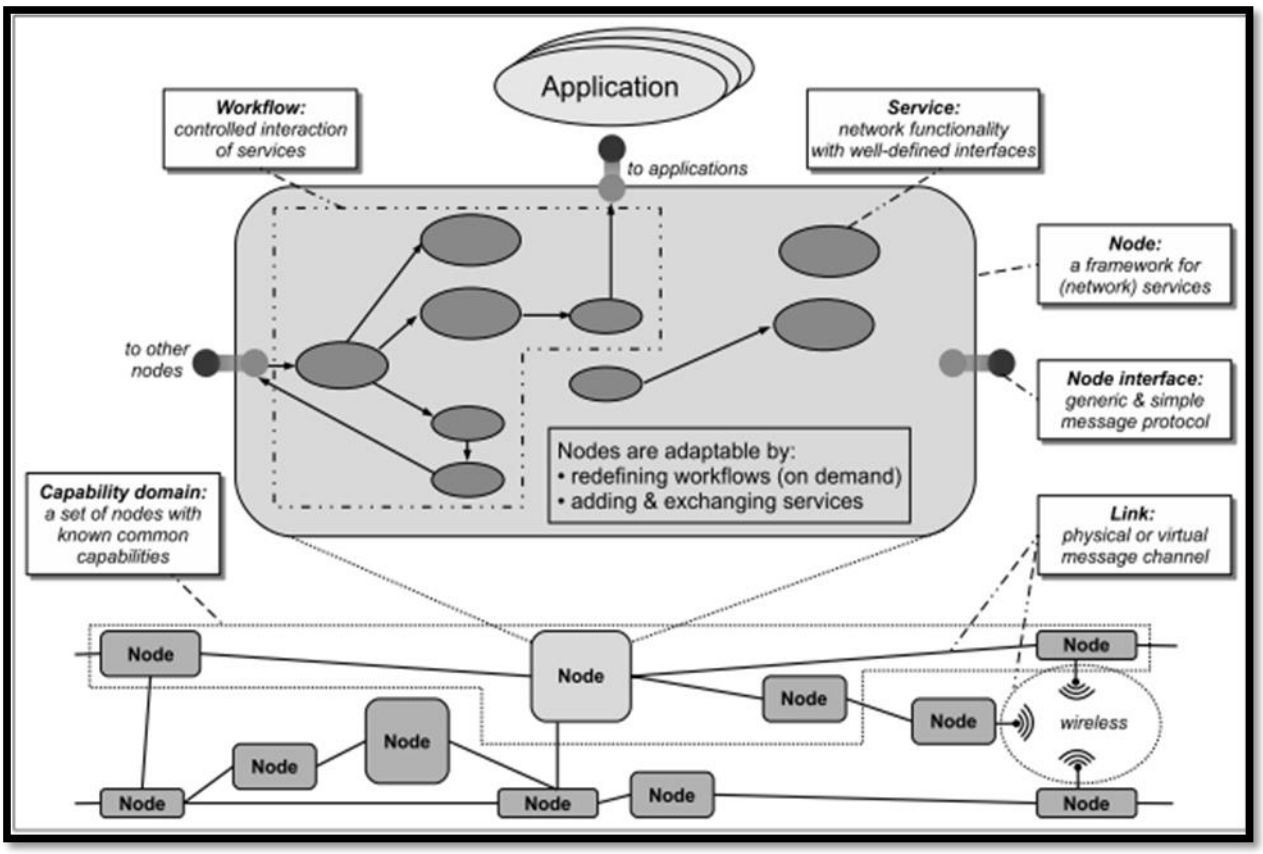

Figure 2: proposed Architecture of internet as a service ecosystem

With reference to Figure 2 , the network is made up of interconnected nodes that provide support for network services. It is the task of the harmonized generic protocol to separate packets of different services and to recognize the service that a message will fit to. This can be achieved by a sequence of simple Category, Size, and Value (CSV) structures; whereby the Category identifies the service and the Size identifies message boundaries or length. The node interface is integrated with defect and confides (D&C) broker. These components maintain session auditing and dynamic trust among services.

CONCLUSION

The ideal Internet is expected to be a holistic communication and information exchange ecosystem which will interface, interconnect, integrate and expand with flexibility, to integrate public and private intranets and networks of any type and scale in order to deliver efficient, transparent, timely and secured services (including essential and critical services) to humans and systems, that is the core of this study. The study has x-rayed the existing system and also proposed a refined internet architecture that ameliorates the deficiencies of the existing system.

In view of the rapidly changing socio-economic influences and evolving technological development, internet will definitely and continuously witness changing trends in its design framework in the bid to further improve its services and potentials in all ramifications.

REFERENCES

Akari, A. (2008). New Generation Network Architecture AKARI Conceptual Design (ver1.1)," AKARI Architecture Design Project, Original Publish (Japanese) English Translation October 2008, Copyright © 2007-2008 NICT

Benson, T., Akella, A. & Maltz, D. (2009). *Unraveling the Complexity of Network Management, in Proceedings of the 6th USENIX Symposium on Networked Systems Design and Implementation.* USA: Berkeley, CA, 335-348.

Clark, D.D., Wroclawski, J., Sollins, K.R. & Braden, R. (2005). Tussle in Cyberspace: Defining Tomorrow's Internet. *IEEE/ ACM Trans. Networking 13(3), 462–475*

Ethan, Z & Andrew, M. (2003). Introduction to Internet Architecture and Institutions

Koponen, T Chawla, M, Chun, B.G., Ermolinskiy, A., Kim, K.H., Shenker, S & Stoica I. (2007). A Data-Oriented (and Beyond) Network Architecture. In: ACM SIGCOMM Computer Communication Review, Vol. 37, issue 4, Oct.

Kreutz, D. Ramos, F. M. V., Verissimo, P., Rothenberg, C. E. Azodolmolky, S. & Uhlig, S. (2015). Software-Defined Networking: A Comprehensive Survey. *Proceedings of the IEEE, 103(1), 14-76.*

National Open University of Nigeria (NOUN) (2010). Course Book on Internet Concept and Web design, CIT 753.