

## **Will ENUM effort in Malaysia be feasible? An academic perspective**

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### **ABSTRACT**

Computer Science education is becoming a fundamental teaching area with the Information and Communication Technology (ICT) development. It is a known fact that traditional educational and

ENUM (Electronic Number Mapping) is powerful protocol that maps telephone numbers to Internet Protocol addresses. It allows users with IP-enabled devices to locate and call friends or families across the Internet, bypassing the ordinary telephone system and thereby cost no more than the rental already paid for the Internet connection. Other benefits include unified address offering and easier communications management. The main purpose of this paper is to study the feasibility of ENUM in Malaysia. The roles of academic institutions, ENUM model and way to conduct ENUM closed trial in Malaysia will be highlighted. Issues of ENUM are also discussed.

**Keywords:** *ENUM, IP, Domain Name System (DNS), closed trial, feasible*

### **INTRODUCTION**

ENUM is a protocol developed by the Internet Engineering Task Force (IETF) (initially in RFC 2916 superseded by RFC 3761) whereby the Domain Name System (DNS) can be used for identifying available services connected to one E.164 number [1]. However, just like the conventional ISDN service, both the caller and the called party for the services must both subscribe as ENUM subscribers (registrants) in order to ensure successful DNS lookup. Having said this, it becomes obvious that ENUM is one potential instrument to provide interoperability of services in telephone networks and on the Internet.

Basically ENUM is the convergence of Public Switched Telephone Networks (PSTN) and the Internet Protocol (IP) Networks. ENUM architecture establishes a bridge between the world of telephony and the Internet. Each country may construct and follow its own ENUM architecture and regulated by its own regulator.

### **FEASIBILITY STUDY OF ENUM IN MALAYSIA**

Surveys involving 90 respondents which compose of telecommunication providers' staff (10), technical support staff (20 respondents) and random Internet users (60 respondents) were conducted via questionnaires to investigate users and technical readiness for ENUM in Malaysia. The reliability of the findings is confirmed with analysis of opinion taken from in-depth interview performed on 10 experts in telecommunication knowledge and have been working with leading telecommunication industries for more than 15 years.

Among the questions asked in the questionnaire are whether the respondents are aware about ENUM and know of ENUM primary function and other functionalities. Questions are also asked pertaining respondents opinion regarding whether: Malaysia is technically and user ready to

implement ENUM; who should manage ENUM if Malaysia is to implement it; should academic institutions help in educating citizen about ENUM and how; can ENUM improve Malaysian quality of communication and lifestyle; do the respondents know of the cost for infrastructure and operation of Malaysia ENUM.

Out of the 90 questionnaire respondents, only 76 feedbacks were received back. The findings of the data analysis conclude that, 77% of the respondents don't know and never heard about ENUM. Those who know are mostly the Telco Expert, the IT /Technical Support personnel. Expectedly, only 12% of the respondents know that ENUM is primarily used for routing VoIP. 55% and 61% of the respondents consecutively agreed that Malaysia is technically and users ready to implement ENUM. 52% of the respondents do not care who should manage ENUM as long as they are not burdened with high subscription fees and forced with unnecessary expenses. 83% agreed that academic institutions should educate citizen about ENUM benefits ( Mohammad Amzari Aziz 2009). 70% of the respondents think that ENUM can improve the quality of communication and lifestyle. Interestingly, 97% of respondents did not have any idea of ENUM infrastructure costing. They believed that, the expert from the telecommunication and financial sites should work hand-in-hand to plan for infrastructure and operation costing of ENUM.

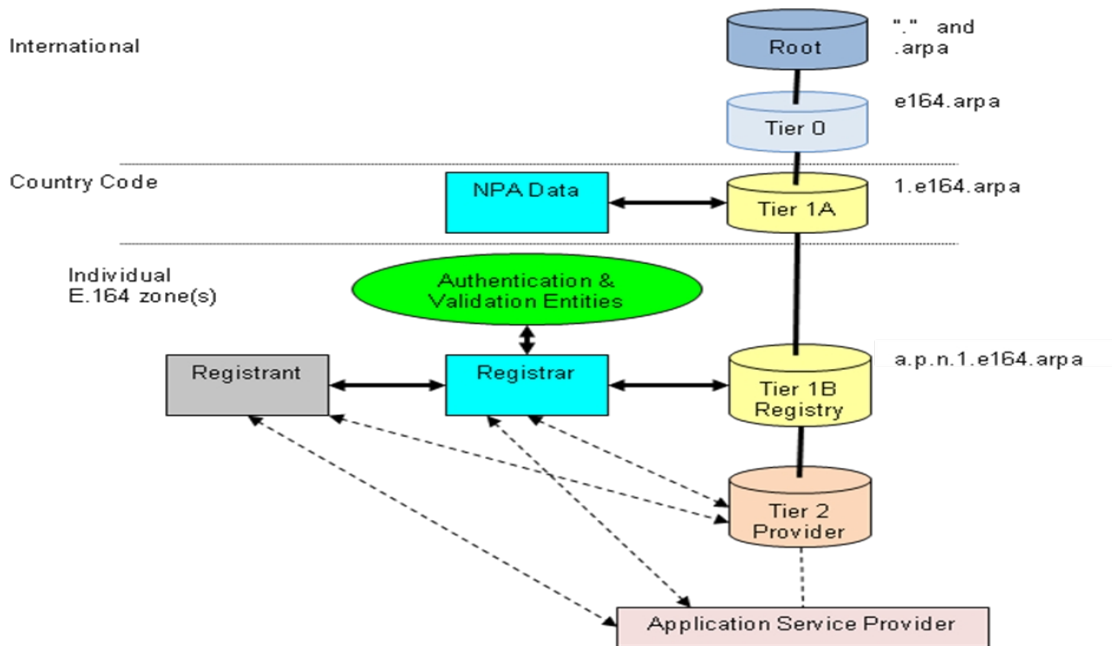
Malaysia is ready to embrace the next evolution of ICT such as experiencing convergence network and Voice over IP (VoIP), as it continues to improve the knowledge of its workers and raises a new generation of technology-savvy citizens. ENUM can be another step in ensuring that the country remains true to its ICT roadmap in becoming a fully-developed nation.

Malaysia DNS service is managed by .my DOMAIN REGISTRY who is in the process of finalising a test bed for ENUM closed trial. Exhaustive dialogues around possibilities of and necessary steps to deploy and implement ENUM with a suitable business model are on progress. Due to this, ENUM Malaysia will no longer be an expectation, but a goal to achieve. However, prior to the production, ENUM trial needs to be planned and conducted first. The question one needs to answer prior to the trial is, how can ENUM be implemented and what could be the best architecture to adopt.

### **POSSIBLE ARCHITECTURE FOR ENUM MALAYSIA**

Malaysia is not the first country in the ENUM effort. Seven countries are involved in ENUM production and five countries are still or have finished piloting it. Since ENUM implementation is still in its infant stage, there would be many upcoming challenges, issues and opportunities be faced by the operators (Saadiah Yahya & Abu Samah S.E 2008). Therefore, the best strategy of how to implement ENUM in Malaysia is to Learn by Example (Best Practice ). However, changes can be accommodated when local policies and cultures are concerned. Through this, Malaysia will learn the success and avoid the failures made by the earlier adopters. Most importantly is to avoid reinventing the wheel (Saadiah Yahya 2009, p.4). Malaysia ENUM implementation architecture is tiered-based as shown by Figure 1. The Model for Malaysia ENUM is the simplified version of the tiered-based architecture as depicted in Figure 2 is proposed.

Tier 0 comprises the root ENUM zone (current 'e164.arpa') administered by IAB-RIPE NCC. Tier 1 will be Malaysia's ENUM root zone of 0.6.e164.arpa, administered by .my DOMAIN REGISTRY (formerly known as MYNIC) through the appointment of the Malaysian Communications and Multimedia Commission (MCMC). Tier 2 name servers that hold the NAPTR records will provide actual communication services. Tier 2 also compose of .my DOMAIN REGISTRY's accredited ENUM registrars that will interface with subscribers to register ENUM in .my DOMAIN REGISTRY's ENUM database (Saadiah Yahya et. al 2008, p.1-4).



**Figure1: ENUM Tiered Architecture**

Source: (Karen Mulberry 2006, p.7 )  
<http://www.ripe.net/ripe/meetings/ripe-52/presentations/ripe52-enum-1.pdf>

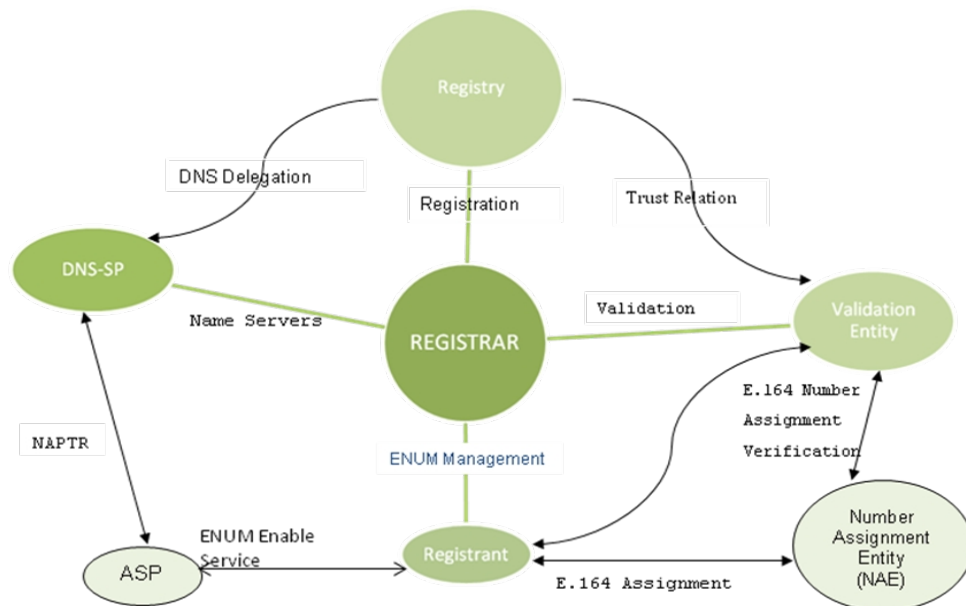
A Registry shall conduct comprehensive threat analysis on all parts of the Registry system to identify the vulnerable points and the types of security attacks. Based on the analyses, the Registry shall define and implement multi-tiered procedures that provide security protections to all parts of the Registry system. Some of security measures include operational system security, physical security, network security, backup security, and security audit and reporting.

**ENUM CLOSED TRIAL IN MALAYSIA**

MCMC under the ministry of Energy, Water and Communication is in position to regulate ENUM in Malaysia. MCMC together with a consortium comprise of appointed companies, .my DOMAIN REGISTRY, Telekom Malaysia (TM), Telecommunication Providers (Telcos), Application Service Providers (ASPs), and the State Department, should be working in collaboration for the implementation of closed trial ENUM. They should agree to agree with the architecture, negotiate with most probable business model and lay the groundwork for obtaining a delegation from the ITU to conduct an ENUM trial in Malaysia. Finally, get the numbers from pilot subscribers and conduct ENUM trial consistent with the Malaysian terms and conditions.

All problems and challenges arise from the pilot ENUM should be analysed, resolved and alleviated prior to the ENUM Production. ENUM regulator (MCMC) should minimize regulation – coordinated, global implementation of ENUM should not give rise to a new regulatory apparatus to govern international and domestic deployments. National Sovereignty should be preserved,

which means that Malaysia must retain the right to determine whether and in what manner ENUM is implemented domestically (Saadiah Yahya 2009, p. 6). The outcomes and analysis of ENUM pilot will be used as a basis of ENUM deployment in Malaysia.



**Figure2: Proposed Malaysia ENUM Model**

Source: (Saadiah Yahya 2009, p.8).

[http://rnd.domainregistry.my/home/enum-seminar-2009/ENUM\\_in\\_Academic\\_Perspective.pdf](http://rnd.domainregistry.my/home/enum-seminar-2009/ENUM_in_Academic_Perspective.pdf)

ENUM efforts will be meaningless when not many registrants register as ENUM subscribers which may mostly return empty records for most of the DNS lookups. Organizations, institutions, agencies and the public at large should be made to understand and realise the benefits of ENUM before they are willing to support it. Therefore, the academicians from higher institutions can spur ENUM effort by educating citizens regarding ENUM benefits. They can also study factors for slow deployment of ENUM by countries that have completed the trial.

### ENUM Closed Trial in Japan and Singapore

As mentioned in Section 3, there are five countries involved in ENUM trial. Japan is one of the five countries that have completed piloting ENUM. However there is no clear indication as to when Japan is planning to implement Japan ENUM. There could be of many reasons and the main one could be the economic factor. Surprisingly, even Singapore is in the state of *wait-and-see* regarding ENUM implementation. Singapore government is not very keen of ENUM trial due to many issues and challenges. Therefore, it needs to first study the feasibility and seeks industry feedbacks and public consultation (Lee Han Chuan 2009, p. 13-15).

Yoshiro YONEYA (2009, p.6) elucidated that Japan ENUM Study Group has been established in September 2002 which composes of 23 members from the private sectors. APEET which comprised of engineers from CNNIC, JPRS, KRNIC, SGNIC, TWNIC, InterNZ and other invited experts was established in 2004 as an informal ENUM project team. APEET goal is to conduct joint trials and to promote the development of ENUM and its related technology such as SIP. Unfortunately, ENUM Study Group has been hibernated since 2003. Almost all works had been completed and succeeded to ENUM Trial Japan (ETJP), but ETJP has also been hibernated since 2008 and awaiting for something to break through. Though Japan ENUM Trial is still running, its actual activity is just providing 1.8.e164.arpa DNS. As for APEET, it has also been hibernated since 2006. Most of activities are declined (Yoshiro YONEYA 2009, p. 7-16).

## **DISCUSSION**

Supporters believe that ENUM can connect a person who uses PSTN telephone with a person who uses Voice over IP phone. ENUM can therefore increase the efficiency of network routing, reduce communications costs, and facilitate interchange of traffic among IP-based networks. Public or end users may experience true convergence by communications through email, fax, instant messaging, or voice calls by using a single telephone number for all transmissions. ENUM can serve as a powerful directory assistance or communications management tool. Caller who knows only a friend's landline phone number can use ENUM to access a file that provides the called party's mobile phone, Blackberry, fax number, or e-mail address provided he or she is also an ENUM registrant (subscriber). ENUM subscribers can create and modify records that control when and through which device or medium they can be contacted.

The definition of ENUM differs for each country and stakeholder. This paper also looks briefly into ENUM technical, security and business issues. Among the obvious technical issues are: the difficulty to guarantee quality of service (QoS); the NAPTR rewriting rule is still not standardized and concrete yet; the tendency of ENUM becomes obsolete when SIP and IMS (IP Multimedia Subsystem) are sufficient. Among security issues of ENUM are: more careful design of name space is necessary especially when the name space is global; measures are needed for the prevention of spam since it is easy to obtain E-Mail addresses; and privacy issues need to be addressed due to ENUM users needing to provide his or her 'raw' information. As for the business issues, the possibility that ENUM could face difficulty in getting market or customer support is there. The main telco like TM may find that, there are no merits of ENUM implementation. Therefore, main challenge of ENUM goes back to a good design of ENUM business model.

Malaysia is technically ready for the ENUM closed trial. This is due to expert human capital availability in the area of next generation network infrastructure and technology, and also the keen support from all concern regarding ENUM trial project. The academic institutions can contribute by educating Malaysia citizens to support ENUM effort by emphasizing its benefits. Regulator control is critical to avoid competition for licensing among interested players and to ensure smooth expedition of the implementation of ENUM.

This study has provided feasible evidence that Malaysia is ready towards ENUM closed trial. Workable Malaysia ENUM model was proposed. The paper emphasized the construction of impartial business model which takes into account the interests of all parties in the ENUM consortium and be regulated objectively by MCMC. This paper has also recommended that lecturers from academic institutions educate citizens regarding ENUM. Academics should research more of the ENUM benefits or limitations, especially why ENUM implementation is not warmly adopted by many countries around the globe. This paper also has reviewed briefly the ENUM efforts in Japan and the Singaporean consideration of ENUM.

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