

Fortune, albeit Digital, at the Bottom of the Pyramid - Big Data Powered Business Model for Internet Service Providers

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Abstract— *The Internet has become an essential part of day-to-day business. Many personal and industrial business use cases assume the availability of perpetual Internet access for fulfillment. The access to the Internet, ironically, is expensive, given various tiered pricing models that Internet Service Providers (ISP) employ. In many developing economies, the availability of the Internet is very sporadic, or only can be afford by a few. The enablement of free Internet access, Wi-Fi access points, in developing economies is huge business opportunity for ISPs. This paper discusses ISP driven business model of providing free Internet.*

Keywords - Free Wi-Fi; Internet Service Providers; Information Retrieval; Natural Language Processing;

I. INTRODUCTION

According to Internet World Stats survey [3], the total percentage of Internet users around the world has reached 45% till the end of second quarter of 2015, a rapid increase from the previous years. The Internet has become an integral part of a day-to-day life. The Internet, importantly, has even become an important economic growth driver for countries gross domestic product (GDP). Nevertheless, the Internet penetration rates are low in some parts of the globe. For instance, Africa has 28.6% penetration rate and Asia has only 40.2%. The average world's Internet penetration rate is 46.4%. There could be several economic and social reasons for lower penetration rates. The primary reason is the availability and the affordability of the Internet Services. In order to solve the problem, many organizations are trying to provide free Internet services for low-income economies. Our goal of the paper is to provide business model that Internet Service Providers (ISP) could employ to generate a sustained economic growth.

II. FREE INTERNET

Free Internet is a service model that deals with providing free Internet services to its user. There are many places where free Internet is provided for instance at airports, hotels etc. The motivation behind such services is to provide better user experience for captive audiences. These services are limited to few places and the current generation demand free Internet at the ISP level.

There are many existing and emerging parties that are providing free Internet to their users directly from the ISP. Some of them are:

i. Muni Wi-Fi

Municipal wireless network (Muni Wi-Fi) is the concept of turning an entire city into a Wireless Access Zone, with the ultimate goal of making wireless access to the Internet a universal service [4].

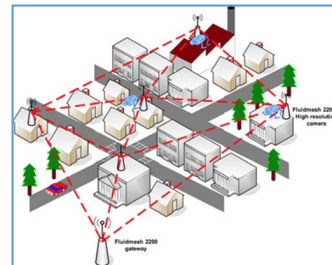


Figure 1: Municipal Wi-Fi Mesh Network [6]

ii. Internet.org

Internet.org is a partnership between social networking services company Facebook and six other companies that plan to bring affordable access to selected Internet services to less developed countries [8].

iii. Internet Service Providers (ISPs)

There are some ISPs that are currently providing free Internet services for limited usage of data.

III. PROBLEMS FACED BY CURRENT SOLUTIONS

The lack of wider acceptance of existing solutions is due to several issues.

- The Muni Wi-Fi is a huge undertaking both cost and infrastructure. In 2005, Jupiter Research Firm estimated the average cost of building and maintaining a municipal wireless network at \$150,000 per square mile over five years [5]. If corporates invest such huge amounts, it would become very difficult for them to get return on investment (ROI) while keeping the service

cost of Internet low. If government invests such huge amounts, they would have to recover the investment through other means, such as increase taxation, which would again burden its citizens. This leads to overall decrease in deployment of Muni Wi-Fi.

- The Internet.org attempts are criticized because it promotes some specific companies' services over its rivals. [7][8]

IV. PROPOSED SOLUTION

In this paper we are proposing a solution for companies to adopt a business model for providing free Internet services for low-income economies while earning profits. As Prahalad and Hart [12] noted, "doing business with low income economies require radical innovations in technology and business models." In our proposed solution the innovation is user-generated data and the proposed business model is monetization of user-centric de-identified data. The ISPs have access to User's each and every location data. By de-identifying data, the ISPs can generate insights that provide more actionable insights. The massive amount of data collected by ISP includes: [1][2].

- Sender and receiver's Internet Protocol (IP) addresses
- Time and Duration for which IP address was connected to the internet
- Track of the volume of packets sent out and received
- If equipped with Deep Packet Inspector, ISP can interrogate or inspect or look into the content of data.

Given the number of connected devices and given the magnitude of real-time network transactions, i.e. the content user generates and receives the ISP inherits or gets troves of user network data. This data exhibits 3Vs - Volume, Velocity, and Variation – and hence can be classified as Big Data. The insights from this Big Data can fuel many business use cases that serve the bottom of the pyramid. Architectures similar to Data Mining reference architecture (Figure 2) can combine data sources from different sources, users, devices, locations, social and organizations to develop and deliver actionable insights.

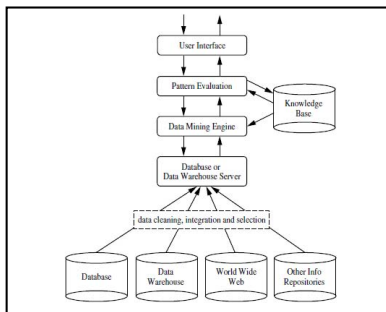


Figure 2: Data Mining Reference Architecture [13]

The insights from the network generated Big Data can fuel many Business verticals: healthcare, consumer product group (CPG), Network satisfaction (NetSat), Agriculture, Education, and many more. These insights have a lot of benefits for Companies, Governments and Business especially when it is generated from the people who have not had exposure to the Internet until now. So ISP can sell the insights to the companies in return for monetary compensation and recover the cost of giving Free Internet while being profitable. It needs to be stated again that the privacy of the User's data would be held at utmost priority and so the data collection would be anonymized and even after that raw data would never be disclosed. Only the insights generated from that data would be given out.

In order to extract insights from the huge amount of data collected by ISP, a lot of processing of various kinds is required. We suggest following steps for Insight extraction:

A. Information Retrieval

It refers to extracting information based on relevancy to certain text or topics.

B. Natural Language Processing

This deals with processing plain English and making it understandable to computer programs. Main task from NLP that we will use for insight extraction are:

- Co-reference Resolution*
- Word segmentation and disambiguation*

C. Sentiment Analysis

Sentiment Analysis gives an insight on what is the feeling associated with a particular topic.

D. Quantitative Text Analysis

Quantitative text analysis is used when a researcher wants to enumerate some aspect of a communication text.

V. TARGET MARKET

The ISP generated network data can enable companies to target several markets. For instance, ISPs usually store user network data in an event log format, "68.18.245.13 on January 16, 2007 at 18:35:22 EST (GMT -0500)", which specifies the site the user visited along with time [9]. The companies that are interested in this kind of data would be all types of e-commerce sites including Amazon, Wal-Mart, eBay etc.

a. Targeted Insight

Our model aims to selectively provide anonymous data to clients categorized via domains, thereby eliminating the need to risk data confidentiality.

b. Estimated Market Value

At the Open Data 2007 conference in New York, David Cancel, CEO of Compete Inc. revealed that ISPs happily sell clickstream data and that it's a big business. They don't sell the name of the user but the clicks of the user. These clicks are tied to a specific user. The clicks are worth 40 cents a month per customer. The ISPs are making \$5 a month per customer this is around 12.5 times the capped amount. In our implementation, we are trying to reduce the capped amount to \$2 a month per customer and provide detailed data to the targeted business [10].

VI. PRIVACY CONTROL

The data made available to the ISPs may often contain sensitive information. The data access level has to be governed by strict regulations and privacy control measures.

VII. BENEFITS

There are variety of areas our model can help leveraging the analytics from the data at disposal.

- *Mobility*
Free Wi-Fi Internet will help mobility to access video call, email, and voice over IP etc. in terms of mobility.
- *Low Cost*
As Wi-Fi is already built into all devices like laptop, Smart Phones, tablets etc., cost for using it will be very low.
- *Flexibility*
Free Wi-Fi internet can be used anywhere like office, home etc. Anyone can use it within designated area of network [11].
 - *Economic Development, Digital Divide*
- *Businesses*
Businesses can focus on their area of interests by exploring data available in their domains. Market trend or the customer usage statistics information is often of prime importance to companies in different sectors.
- *Government:*
Governmental agencies will benefit in terms of providing public safety, making small towns attractive for tourism, generate revenues by providing free internet and applying data analytics on data generated from usage of people [4].
 - *Public safety, Reduced Crime rate, Disaster recovery, Tourist attraction.*

VIII. CONCLUSION AND FUTURE WORK

Our solution aims to provide a viable outcome to provide Internet services using various pricing models. These models

can be classified into three major categories based on the category user to select. Firstly, free Internet model that allows the ISP to apply analytics on the data usage of the user. Secondly, Data Privacy model, for users who do not wish to share their data usage details. Finally, Business oriented model that is designed to monetize the analytics of the data usage from ISPs to third party enterprises that can be used in a variety of domains.

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