WEB CONTENT FILTRATION ALGORITHM TO CONTROL UNSOLICITED CONTENTS IN INDIA

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(Vardhman Mahaveer Open University, Kota 1987, Act No 35/1987)

THESIS SUBMITTED FOR DEGREE OF

Doctor of Philosophy

in

Computer Science

By

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I am especially thankful to my friends who always suggested me to do hard work.

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ACKNOWLEDGMENT

It is a matter of immense pleasure for me to take this opportunity to express my gratitude to all without whom it would not have been possible to write this doctoral thesis. It is also true that it would be impossible to thank everyone who has inquired over the years; however, my words fail to express the gratitude to the Almighty for giving me the opportunity and continued strength.

I extend my sincere gratitude to my supervisor, Dr. Harish Sharma, Associate Professor, Computer Science, Rajasthan Technical University, Kota & Former Assistant Professor, Computer Science, Vardhman Mahaveer Open University, Kota for his guidance, suggestions, and encouragement. This thesis would not have been successful without the unwavering mentoring I received from him. His valuable support and comments have been of inestimable value throughout my work. This will always be with me as a precious asset.

I would like to express my special thanks to former Vice Chancellors: Professor Vinay Kumar Pathak & Professor Ashok Sharma & the present Vice-Chancellor Professor R. L. Godaraa for their invaluable guidance and support to complete this doctoral research. I wish to pay my gratitude to Prof. B Arun Kumar, Director Academic and former director academic Prof. HB Nandwana, Prof. PK Sharma, Director School of Commerce and Management.

I also express my gratitude to Dr. Subodh Kumar, Director, Research along with Dr. Kshmata Chaudhary and Dr. Patanjali Mishra, Deputy Director, Research, VMOU for their help in shaping this thesis.

I express my sincere gratitude to Professor R. R. Singh, Professor, Dr. Shakuntala Misra National Rehabilitation University, Lucknow, Uttar Pradesh, for enlightening me for research work in this direction. I wish to pay my abundant gratitude to Dr. Akhilesh Kumar Pathak, Dr. Alok Chauhan and Dr. Anurodh Godha, to illuminate my path and cultivate interest in understanding the various aspects related to my research.

Whatever I am today is because of the endless sacrifices, supports, and blessings of my parents. My father taught me the importance of hard work and honesty at any cost

& my mother made me to learn to help everyone. My elder brother Ashish Kumar Pandey and sister Pooja Pandey were always stood beside me to make my all little efforts into a grand success. Their contributions are beyond any acknowledgment. I feel humble to utter my sense of gratitude to my wife Supriya Pandey & my son Atulit Pandey 'Raghav' for their unconditional love; care and support during the entire research work.

I cannot forget the motherly care and love of Dr. Vandana Pathak, who was always, reminded me about my potential and abilities.

I am grateful to the Director Library and library staff of the Central Library & Research Department of Vardhman Mahaveer Open University for their sincere help and co-operation. I am also thankful to the office staff of the research department (Mr. Suresh Saini and Mr. Balkishan) for their co-operation in dealing with the official procedure.

(Saurabh Pandey)

LIST OF ABBERVATIONS

WWW	World Wide Web
ISP	Internet Service Provider
URL	Uniform Resource Locator
TLD	Top Level Domain
ccTLD	Country Code Top-Level-Domain
DNS	Domain Name Server
HTTP	Hyper Text Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
ICMP	Internet Control Message Protocol
MAC	Media Access Control
AI	Artificial Intelligence
ML	Machine Learning
DPI	Deep Packet Inspection
SWLA	Semantic Web Learning Algorithms
IVLA	Image Video Learning Algorithms
IVALA	Image Audio Video Learning Algorithms
OA	Other Algorithms
KB	Kilo Bytes
MB	Mega Bytes
GB	Giga Bytes
TB	Tera Bytes
LAN	Local Area Network
MAN	Metropolitan Area Network
WAN	Wide Area Network

WLAN	Wireless Local Area Network
OS	Operating System
VPN	Virtual Private Network
PC	Personal Computer
OSI	Open System Interconnection
TCP	Transport Control Protocol
UDP	User Datagram Protocol
IP	Internet Protocol
GOI	Government of India
DOIT	Department of Information and Technology
POPU	Problematic Use of Online Pornography
IAMAI	Internet and Mobile Association of India
CSAM	Child Sexual Abuse Material
IWF	Internet Watch Foundation
DDNS	Dynamic Domain Name System
CIBERSAM	Centers for Biomedical Research in Mental Health Networks
WCF	Web Content Filtration
ONI	Open Net Initiatives
OLUT	Ordinary Lookup Table
BLUT	Baysian Lookup Table
RTI	Right to Information
DOT	Department of Telecom
IMC	Inter-Ministerial Committee
RTO	Request Timed Out

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ABSTRACT

Consequent upon the over interaction between humans & Information and Commutation Technology(ICT), the Internet Addiction Disorder (IAD) & Game Disorder have been included in latest versions of Diagnostic and Statistical manual of Mental Disorders-V (DSM-V) of American Psychiatric Association (APA) & International Classification of Disease-11 (ICD-11) of World Health Organization (WHO) respectively. With the rapid development of tools of ICT, the access of Internet is no longer a luxury rather is a necessity in terms of its accessibility in each and every corner of the globe. Despite of the benefits, ease of Internet access posed several challenges towards the world and to control the unsolicited content available over Internet is amongst one of such herculean challenge not only for experts of Information Technology but also for legal and education experts as blocking information available over the Internet invites legal as well as ethical issues. Obnoxious content such as violence, pornography, misconduct, mischief, suicide games etc. available over the Internet resulting in increased anti-social as well as criminal activities and the measures taken to control the access of such content has made the cognoscenti to think of an effective eclectic model of Web Content Filtration Mechanism for unsolicited content. Most of the countries around the world are in process of developing policies related to such effective web content filtration mechanism and India is also not an exception of it. The traditional manual moderation mechanism for web content filtration is like a drop in the ocean and is quite difficult if not impossible. The present study was tailored around to develop an effective sustainable model for web content filtration mechanism for unsolicited content over the Internet. To accomplish this work five research questions and five research objectives were framed. Furthermore, this research put forth the in-depth analysis and interpretation of prevalent blocking mechanism used by Government of India (GoI) before concluding over the final model.

Key words: Internet, Unsolicited content, Pornography, Web Content Filtration, ISPs, IP, Algorithm.

CHAPTER – 1

INTRODUCTION

1.0 Introduction

In the present scenario, users are consuming daily data limit of approx 1.5GB to 2 GB to access and upload the images, videos and movies over the Whatsapp, Facebook, YouTube, Hotstar, Amazon Prime, Instagram and other popular Mobile Apps like TikTok, etc., which is faster than ever before. This credit goes to the low data charges by Reliance Jio in our country. In the year 2017, approx 1.1 trillions of photos were captured and shared online. Facebook rate of uploaded photos approx 299 million photos per day, a team of 7500 moderators dedicatedly working for this. These social media and media sharing platforms contaminated with blacklist content for the youth or children. In 2018 taking this into consideration, the Indonesian government banned the TikTok mobile app, which was popular among 13 to 15-year-old. Here's the excerpt of the newspaper.

The ministry said that it banned the app because it contains negative videos that are deemed to be a bad influence on the youth. Public sentiment in Indonesia is turning against Tik Tok, which is popular among 13 to 15-year-olds, as it has clips of teens engaging in provocative behaviour. One such video depicts a teen dancing. It then cuts to a dead body, apparently a relative of the teen.

(Sources: https://www.techinasia.com/popular-music-app-tik-tok-banned-indonesia)

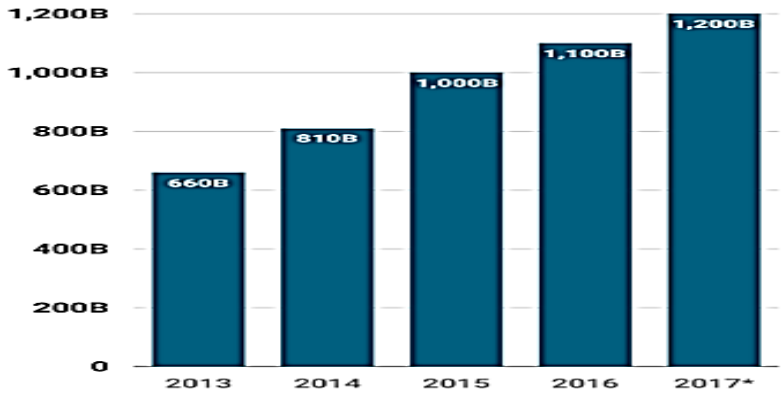


Figure – 1.1 : Number of Digital Photos taken Worldwide

(Sources: https://www.businessinsider.in/tech/people-will-take-1-2-trillion-digital-photos-this-year-thanks-to-smartphones/articleshow/60316991.cms)

Apple removed the Tumbler's app due to the reported issues of child pornography. A few months back, Facebook reported the removal of tens of millions of photos and videos due to the violation of its terms of service in regard to child pornography, drug, and terrorism. Continuation of this Facebook says 11.6 million pieces of content deemed as child nudity; perhaps it is the most shocking detail. Instagram removed approx 1.1 million photos and videos contaminated with child nudity. Anyone can judge the potency of this matter easily if the world's best companies like Facebook, Google, Instagram are in no reply situation on these blocking issues. At the YouTube website, approximate 400 hours of videos get uploaded every minute. It means 2400 minutes of videos uploaded every minute, so how many moderators have sufficed the scrutiny of these uploaded content, and it clarifies the magnitude of the problem with unaddressed multi-dimensional issues of criticality.

The study on the effectiveness of the blocking mechanism is crucial in knowing the current practices used for blocking the websites in India. The report released by Kantar IMRB ICUBE 2018 reveals that the internet user base in India has crossed 500 million watermarks and is about to reach 627 million by the end of 2019. The number of internet users is supposed to be 566 million as of December 2018, registering an annual growth of 18 percent (Pti., 2019).

The rapid growth of internet users in India has made it a country prone to abuses of the internet too. Kids, as well as adults, are gradually becoming more addicted to the internet in general and unsolicited content available over the internet in particular, creating a worry to the nation to block unsolicited content available over the internet to save Indian socio-cultured structure and innocence of kids. Stride efforts have been being made by the Government of India (GOI) to block or restrict open access to such unsolicited content. The following diagram presents the comparative growth of internet users for the last three decades in India and China.

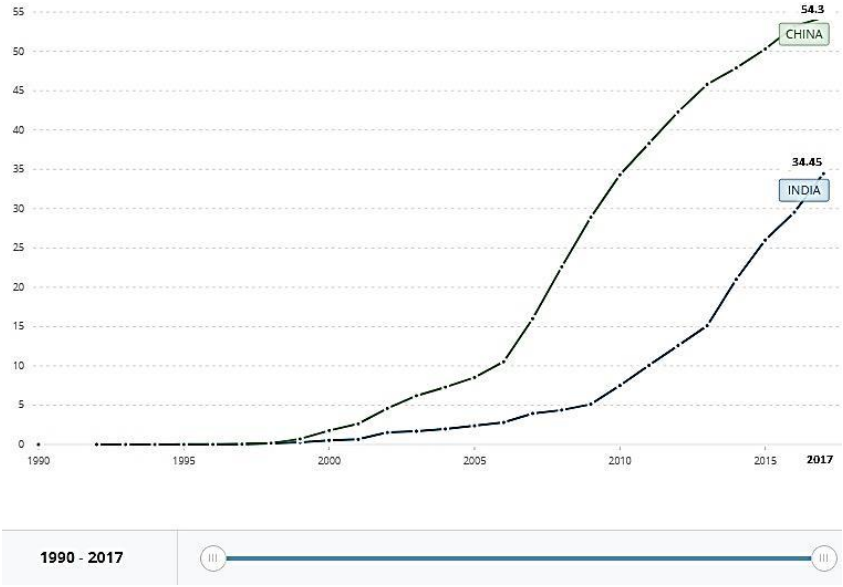


Figure – 1.2 : Internet users in India 34.4% of the population (2017)

(Sources: https://data.worldbank.org/indicator/IT.NET.USER.ZS?contextual=default&end=2017&locations=IN-CN&start=1990&view=chart)

In one of its decision, Uttarakhand High Court states, "Unlimited access to these pornographic sites is required to be blocked / curbed to avoid adverse influence on the impressionable mind of the children". The court also directed the GOI to suspend the licenses of internet service providers, under Section 25 of the Information Technology Act, 2000, if they don't comply with the notification of 31st July 2015. The notification listed over more than 800 websites and directed internet service providers to block access to them as the contents posted on these websites "infringed morality and decency" (Santoshi, 2018).

The minutes of the Cyber Regulation Advisory Committee meeting held on 5th September 2014 in DietY. Secretary, Department of Information and Technology (DOIT) informed that the blocking of websites had been implemented through ISPs immediately when orders were received for blocking. The infrastructures at ISPs need to be upgraded to deal with such a large number of web sites for blocking.

At present, the government delegates the censorship of internet traffic through ISPs. As per the analysis of blocking data mechanism of websites is not much encouraging then how the government might enforce a unified censorship policy for the whole county in the future (Gosain *et al*., 2018).

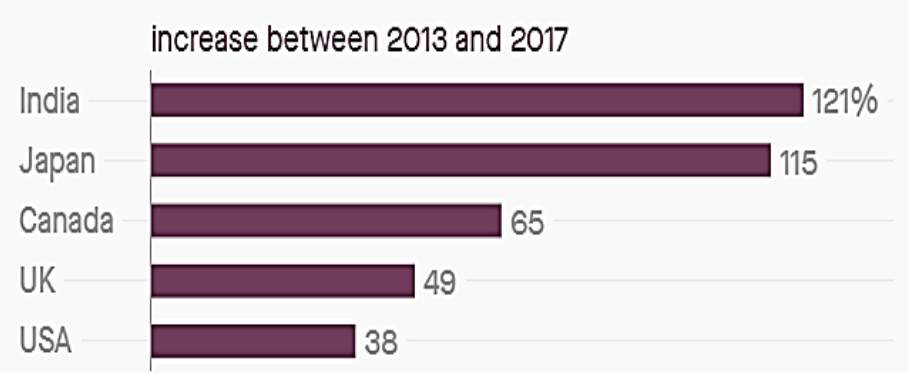


Figure – 1.3 : Growth of mobile traffic share in Pornhub's top five markets

(Source: Pornhub - https://www.theatlas.com/charts/HkJBO-PHG)

The viewing of adult content soared 75 percent since data rates came crashing down in the second half of last fiscal 2016 under severe competitive pressure, according to video viewership tracker Vidooly's findings, available exclusively with ET Telecom.com from the Economic Times. The new entrant Reliance Jio's aggressive pricing forced incumbents Bharti Airtel, Vodafone, and Idea Cellular to slash down data rates, even as porn viewing surged - primarily in tier 2 and tier 3 towns. It is more interesting to note that about 80 percent of the web content is in short form, and tier 2 and 3 towns contribute 60 percent of total viewership.

On one side, research findings support the positive correlation between video consumption and its impact on the brain to learn and remember things very quickly while the other side there is open internet for all age groups with the factious visuals. In the present scenario, it would be a matter of great importance to differentiate between the reality of visual content against the fake and fiction ones.

Studies related to trends in pornography preferences, Pornhub reports on the device types used by its customers. Its 2018 report has shown that customers are increasingly enjoying their porn material on the go using their mobile phones. In 2013, only 40 percent of Pornhub's traffic was on the phone, which increased to 67 percent in 2017 (Kopf & Kopf 2018).

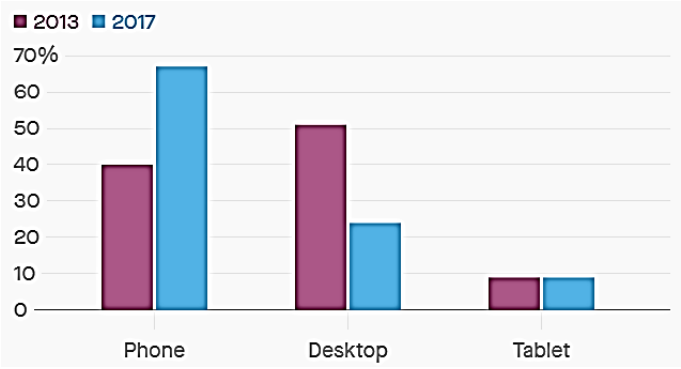


Figure – 1.4 : The trend of porn users moving to mobile devices

(Source: Pornhub - https://www.theatlas.com/charts/BJBi_GNBM)

In recent years, internet addiction has become more prevalent worldwide, and its adverse impact on the health of society is also not invisible. Hou *et al*. (2012) has conducted his study titled "Reduced Striate Dopamine Transporters in People with Internet Addiction Disorder". The study revealed that internet addiction might induce significant Dopamine transporter losses in the brain, and findings suggested that internet addiction is associated with dysfunctions in dopaminergic brain systems. The findings also supported the claim that internet addiction may share similar neurobiological abnormalities with other addictive disorders.

Alarcón *et al*. (2019) have conducted a review on "Online Porn Addiction: What We Know and What We Don't". Authors concluded that pornography addiction is a type of hypersexual disorder and may be composed of several sexual behaviors, such as the problematic use of online pornography (POPU). They further identified that online pornography use is on the rise, with a potential for addiction, and this problematic use has adverse effects on sexual development and sexual functioning, particularly among the young population.

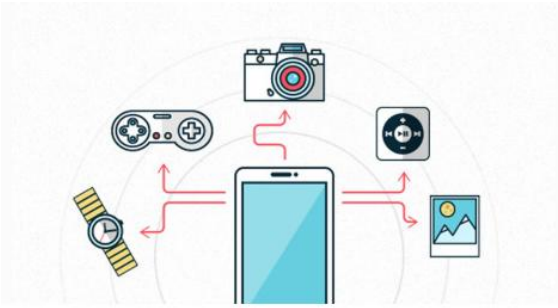


Figure – 1.5 : How the Internet of things is changing the world around us (Source: https://www.netsolutions.com/insights/how-the-internet-of-things-is-changing-the-world-around-us/)

In Oct. 2018, the Indian government's telecom department communicated internet service providers (ISPs) to ban 827 websites for hosting pornographic content. (Singh & Singh 2018) reported that this is the second attempt in recent times by India, among the most prolific consumers of porn watching, to shut it out. In August 2015, following a Supreme Court verdict, the government had unsuccessfully tried to block about 857 websites because such content promotes sexual assault. Further, the Uttarakhand high court has reinstated the Supreme Court's ban after a rape accused in the state's capital Dehradun said the third person the culprit was nudged into committing the crime after watching a porn movie (Singh & Singh 2018).

A few years back, various websites were blocked in totality by service providers when they were only directed to block a particular webpage. The logic and rationale given by these providers were that since they lacked the intrinsic mechanism to block a webpage, they blocked the entire website.

As of now, whatever is discussed was focused on abuses of the internet but can be very useful if used properly. For example, as far as the teaching and learning process is concerned, watching educational videos may be the best way to improve learning, especially when it comes to remembering key facts and figures. In fact, according to Dr. James McQuivey of Forrester Research, one minute of online video equates to approximately 1.8 million written words. In addition to this, 90 percent of information transmitted to the brain is visual, and visuals are processed 60,000 times faster in the brain than text. That indicates that visual education aids like video can improve learning and increase the rate at which one retains the information.

There is sufficient proof that teaching online educational videos available on *YouTube* or any other platform is facilitating the teaching and learning process. The teachers and the student both get benefited from this. The study conducted by Elyas & Kabooha, entitled "The Impacts of Using *YouTube* Videos on Learning Vocabulary in Saudi EFL classrooms", indicates that videos on youtube are making teaching and learning process attractive, interesting and enjoyable. These videos play a crucial role in motivating students intrinsically and as well as extrinsically. Alwehaibi (2015) concluded in his research that the use of *the YouTube* platform resulted in reading, writing, analyzing, interacting, seeking part in different activities throughout the learning cycle.

The study conducted by FSG organization a statewide pilot of Khan Academy in Idaho with 173 teachers and 10,500 students during the 2013-14 school year shows that students who complete 60% of their grade-level math on Khan Academy experience 1.8 times their expected growth on the Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) test, which is a famous achievement of mathematics (Phillips *et al*., 2013-2014)

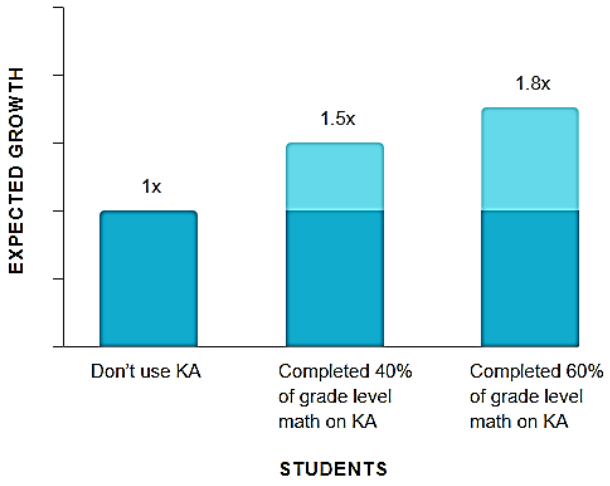


Figure – 1.6 : Impact of Khan Academy on the level of achievement of Mathematics

Source: https://www.khanacademy.org/about/impact)

In the current era, the internet has become an essential part of everyone's life for people from all walks of life. Because of this, it has become the electronic superhighway where one (every age group persons) information needs are satisfied. The internet has become a global

communication medium, and people of all age groups use it for their daily needs, either for computing, communication, or learning & teaching (Peddi Karthik, 2013).

India, the largest democratic country, is set to emerge as an IT superpower in this millennium. India is on the brink of an internet boom. According to the projection of internet and mobile association of India (IAMAI), the internet user base in the stood at 243 million at the end of June 2014 and a year on year growth of 28 percent with a projected user base of 330 million to 370 million by 2015, which will be the second-largest in the world (Gomes, 2012).

The saying "***if you open the window for fresh air, you have to expect some flies to blow in***" is perhaps a truth about the present IT revolution across the world. The media, including images, videos, books, magazines, animations, and video games, is attracting children towards the power of the internet in early ages. CBSE, ICSE & other educational institutions in India are compelling kids/ students to complete their project work/ assignment through the internet. No one has included school educators, parents, cyber experts & govt of India is bothered about the unsolicited content over the web, and these contents are sufficient to derail our kids/student/youth of country from the right path. The minds of immature children are mainly contaminated by these fictitious and edited undesirable contents on the internet, which are available free over the web.

The statistics on internet pornography illustrated the magnitude of the industry & its potential for social impacts. It is estimated to be a $3 billion annual industry nearly 15 percent of all websites (4.5 million) have pornographic content; over 25 percent of total search engine requested are for pornography; 35 percent of download (over 1.5 billion per month) is pornographic, and over 75 million people annually visit porn websites. The lots of consumer set of internet pornography is the 12-17 age group, and 90 percent of 8-16 year olds have viewed pornography online, mostly when they do their homework (James F. Quinn University of North Texas).

On the basis of various researches and outcomes from multiple disciplinary studies, west countries are focusing the attention to block pornographic content over the web. In connection to that, Prime Minister David Cameron announced a plan to filter online pornography by default for households in U. K., saying the initiative is about protecting children and their innocence (Peterson, 2013)**.**

China’s Internet filtering regime is a sophisticated effort of its kind compared to similar efforts in other countries; the current filtering mechanism used by China is highly efficacious up to a great extent. It consists of multiple levels of legal regulation and technical control over the network and its content. Across the world, only China has completed a Golden Shield Project, often referred to as the great firewall of china somewhat similar to the Great Wall of China, controlling the accessibility. As per the sample test and results on http://www.greatfirewallofchina.org/, it is surprising not even google.com and facebook.com are allowed to surf in china. China does not permit any kind of outside intervention that may leak recent technology and R&D of China (Deibert, 2012).

As reported by Seth (2014), India has the largest child population in the world, with almost 41% of the total population under 18 years. The use of existing web tools and the development of mobile devices have made them prone to access age-inappropriate content from the web, which may negatively influence their social, physical as well as mental development. Considering the situation, India needs a reliable and very effective content filtration mechanism to save the children an early age.

1.1 Historical Background of Internet and Web Content

1.2 What is the Internet?

The internet has endless capabilities; few are word full broadcasting, information sharing, people's interaction, and communication regardless of their geographical location. The internet has revolutionary changed the way of digital communication and collaboration of information like never before. First, the telegraph, the telephone, the radio, and then computer invention set the stage for this unprecedented integration of capabilities.

1.3 The Expansion of Internet

The first available description of social interaction that is likely to be enabled through networking was a dangerous written by J.C.R. Licklider of MIT in August 1962 discussing his ‘Galactic Network’ concept. He visioned a globally interconnected set of computers through which everyone could quickly access data and programs from any site. This concept was more applied to the present era of the internet. Licklider was the first headed the computer research program at DARPA-4, which started in October 1962. While at DARPA-4, he convinced this successor at DARPA, Ivan Sutherland, Bob Taylor, and MIT researcher

Lawrence G. Robert's significance of this networking approach. Leonard Kleinrock at MIT published his first paper on packet switching theory and the first book in 1961. Kleinrock convinced Robert's theoretical feasibility of communication using packets instead of circuits was a major essential step in the field of computer networking. To explore the idea behind this, Thomas Merrill and Roberts worked together, and in 1965, Roberts established the connection of TX-2 computer in Mass to the Q-32 in California using a low-speed dial-up telephone line forming the first small-sized wide-area network of computers ever made. This experiment strengthened the concept of time-shared computers that could work altogether while running programs and retrieving data as per need on the remote machine, but that the circuit-switched telephone system was not at all adequate for this job and the need of packet switching was confirmed. Roberts went to DARPA in late 1966 for the development of the network concept and quickly put together this plan for the "ARPANET" which was published in 1967.

1.4 The challenges posed by the internet in front of humanity

The access of the internet has rapidly penetrated our daily life. Undoubtedly the internet has become a more important medium of communication than any other communication. Although it is a proven fact that it is getting more and more contaminated with various harmful and not desirous content, such as pornography, violence, hatred, terrorism, fraudulent activities, and many more. We have seen this in recent years that one in four kids reported having at least one undergoes exposure to unsolicited content or sexually explicit content during the past year. Recent statistic visualizes that 25% of the queries in search engines, 8% of emails, and 12% of home pages are porn-related. Undoubtedly, parents, teachers, and society at large tend to have better control over the information exposed to their children when surfing the web. This need has exposed us towards the vital mechanism of filtration of unsolicited content. The same problem is with an employer, for example, an employer does not want their employee to watch the stock information or mutual funds status during working hours in both of the cases cited above it becomes quite clear that there is some need of web filtering that enforce excess control on web without affecting the routine work.

1.4.1 Challenges of obscene content

Obscene content seems as a neglected problem in the society and by the government, whereas in recent past, the pornography which itself emerge from the Greek word 'porno- graphic'

literally meaning writing about prostitutes. Apart from this, one of the readily accepted definitions of pornography in modern times defines it as sexually explicit material (verbal as well as pictorial) that is primarily designed to produce sexual arousal in viewers. The online adult industry has emerged as the most profitable business branch on the internet, and its websites attract a large number of visitors in traffic. A question is always asked that is there a connection between the online adult industry and cybercrime? According to web statistics, adult websites rank among the top 50 visitor website word wide. Anonymous and free access to pornographic media appeals to a vast audience and attracts a large amount of internet traffic, resulting in the significant financial business.

1.4.2 Terrorist activities and content filtration/ blocking

The world is suffering from various types of terrorist activities. Terrorist is highly dependent upon the technology for the exact execution of their plan. It has emerged in the recent past as a challenge for countries like India to stop or have a close watch over the activities of terrorist organizations online. In recent experiences, we have also visualized that caste and religion-based hatred is being spread through videos, texts, and social media. It has evolved as a significant challenge for Government India. This type of need has motivated the researcher to take up a topic like this.

1.5 Background of web content filtering

Content filtering is a relatively new subject in the technological area. The massive volume of internet content is widely accessible nowadays. One can easily view inappropriate content at their will without access control. An effective web content filtering solution scans more than the name of its domain. It can break down and analyzed the web traffic making it capable to precisely pinpoint portions of a web page that should not be allowed into the internal network. Content filtering is a type of firewall level to block specific sites from being accessed in a network.

Many scholars believe that task web filtering is easily achievable and straight forward. Install it, select what sites need to be blocked and be done with it. As with any new technology, that concept no longer works. Even with the web filter, it is essential to understand and manage your system properly, not just throw it, in turn, it on. Take time to review requirements and policies, explore currently available products, and learn how to use those products to their full utilization.

1.6 Filtering is necessary or not: An ethical question

Internet use is currently pervasive, and its distribution is most likely to increase. It's access, at a little cost, to unquantifiable data and information used for study, travel, and news. For many types of work, internet use has become indispensable at least very because it provides the opportunity to save travel and other expenses, including knowledge that is elsewhere very difficult to obtain. The internet is electronic mail, which allows for fast communication worldwide, and provides some useful services. For instance, services that use electronic mail, indexing of new journals in a particular field of science, and the humanities to which the person subscribes, commonly free of charge. The internet is considered as a free and open network for which filtering of content is not performed. Only activities that constitute serious crimes (terrorism, pedophilia, and credit card fraud) are monitored and persecuted by the police, although sometimes the complexity and size of the network can let such crimes to happen.

The internet offers the opportunity to find the actual content, which provides the facility for the expansion of sound doctrine. It allows overcoming any monopoly of large and negatively oriented publishing groups (television, newspaper chains). On occasion, the internet may offer content of poor scientific quality (false or unreliable information), or even content which is pornographic (of various grades of harshness), violent, racist, or terroristic. For utilizing the good of the internet, few scholars suggest that filtering is necessary, whereas few scholars recommend that policing is not good at all. Now the primary concern arises whether content filtration should be done or not? The advocates of freedom of expression and consumption say that filtering does not resolve the problem because no filtering technique is perfect, and they also say that India is a free country, and we can consume whatever we want to consume. We can only do things better by making other people understand the repercussions of pornographic or obscene contents.

1.7 The effectiveness of filtering technique

As part of its defense of the online child sexual abuse material (hereinafter called "CSAM") is the critical public policy of India, and the Central Government intends to prevent from viewing commercially published harmful material on the World Wide Web (WWW). Unwanted/porn material hosted websites receive more regular traffic than Netflix, Amazon, & Twitter combined each month. 35% of all internet downloads contain unwanted/ porn material. 34% of internet users have been exposed to unwanted/porn material via ads, pop-

ups. The overall transmitted data over the internet consists of 30% of unwanted/porn data. Unwanted/ porn material estimated $97 billion industry, with about $12 billion of that coming from the U.S. 64% of young people, age 13-24, actively seek out unwanted/ porn content weekly or more often.

These issues are not going away as long as society continues to deny the real, proven harms of porn, and a vast majority of people believe the lie that it is harmless. At one point in time, porn was not a common issue that affected millions of people, much less all of society. It was not a topic that needed to be discussed with such urgency. But, just by looking at these stats, it seems like those days are over (https://fightthenewdrug.org).

1.8 Taxonomy of Web Content Filtration

Web filter categories database is upon the web content viewing suitability of three major groups' enterprises, schools, and home/families. The different categories are easily manageable and patterned to industry and home user standards. All the service providers maintain their content category database to filter the web content.

Each category contains the list of domain names or web pages addresses that have been assigned based on the availability of the nature of web content. As per the nature of the content available over the website, a website belongs to a specified blacklist category that is supposed to be blocked. When a website contains elements of other categories, web pages on the site are treated separately. All the presently available solutions regarding web content have their own database of the websites and their categories. The following best web filtration categories (Fortinet, 2016) are given as below -

1.8.1 Adult / Mature Content Category

Alcohol	Websites belong to this category hold the information on alcohol products and accessories related to alcohol products.
Dating	Websites that allow peoples to make interaction and communication with each other over websites, usually the objective of these websites for developing a personal and romantic relationship.
Gambling	Websites offer gambling activities, including betting, lotteries, casinos, including game rules, instruction, and statistics.
And More	Abortion, Advocacy Organizations, Alternative Beliefs, Lingerie

	and Swimsuit, Marijuana, Nudity and Risqué, Other Adult Materials, Pornography, Sex Education, Sports Hunting and War Games, Tobacco, Weapons (Sales)

1.8.2 Bandwidth Consuming Category

File Sharing and Storage	Websites that allow users to use internet servers to store personal files, photos, videos.
Freeware and Software Downloads	These websites' primary function is to make the availability of freeware and software downloads. Mobile phone ringtones, images, video, games, computer software updates for free downloads are all included in this category.
Internet Radio and TV	The websites that provide online internet radio facilities.
And More	Telephony, Peer-to-peer File Sharing, Streaming Media and Download

1.8.3 General Interest – Business Category

Armed Forces	These Websites holds to information of military and armed forces, excluding civil and military organizations.
Charitable Organizations	Sites represent the organizations that are set up to serve as a public cause and are philanthropic. This category excludes the association with any political organization.
Finance and Banking	Financial Data and Services -- Sites that provide the information of available stocks, government bonds, and other investment plans, systematic investment advisory, excluded online trading information. It also includes online banking services, credit card unions, credit card services, and insurance services. Mortgage brokers can apply here as opposed to Brokerage and Trading malfunctioning issues.
And More	General Organizations, Business, Government and Legal

	Organizations, Information Technology, Information and Computer Security, Online Meeting, Remote Access, Search Engines, and Portals, Secure Websites, Web Analytics, Web Hosting, Web-based Applications

1.8.4 General Interest – Personal Category

Advertising	Sites that comprise of advertising media content in the form of ad videos, images, and text. If a site is for online transactions, it is rated as Shopping and Auctions. It also includes pay-to-surf and related advertising programs.
Arts and Culture	Websites that promote fine art, cultural activities, artwork, music and paintings, competitions. It also includes institutions such as museums, public libraries, and historical places. Sites that promote historical and cultural values heritage in a specific area, but not purposely promoting tour and travel services.
Auction	Websites provide the online functioning of sale of general goods, electronic items, flowers, jewelry items, music galleries, audio platforms, excluding real estate functioning. It also includes online e-commerce services such as Amazon, Flipkart, and Snapdeal.
And More	Brokerage and Trading, Child Education, Content Servers, Digital Postcards, Domain Parking, Dynamic Content, Education, Entertainment, Folklore, Games, Global Religion, Health and Wellness, Instant Messaging, Job Search, Meaningless Content, Medicine, News and Media, Newsgroups and Message Boards, Personal Privacy, Personal Vehicles, Personal Websites and Blogs, Political Organizations, Real Estate, Reference, Restaurant and Dining, Shopping, Social Networking, Society and Lifestyles, Sports, Travel, Web Chat, Web Chat, Web-based Email

1.8.5 Potentially Liable Category

Drug Abuse	Websites that provide information for prohibited drugs, including drug promotion activities, drug consumption activities, drug preparation activities, cultivation activities, trafficking, distribution.

Child Abuse	Websites that have been reported by the Internet Watch Foundation (IWF) for storing and distribution of non-adult children images or videos that are depicted in a state of abuse as per the online child protection act. Complete details of the Internet Watch Foundation is available at https://www.iwf.org.uk/
Extremist Groups	websites engaged in radical militia groups or radical militia movements with aggressive anti-government convictions or beliefs.
Hacking	Websites that provide the tips and tricks for unauthorized access through the help of any programs to steal user information like credit card information and debit card information. Unallocated access and control of the computer system and types of equipment.
And More	Illegal or Unethical, Plagiarism, Proxy Avoidance, Explicit Violence

1.8.6 Security Risk Category

Dynamic DNS	Websites that provide Dynamic Domain Name System (DDNS) services to map a Domain Name to a specific IP address or set of IP addresses in round-robin fashion. These services are used for DoS and DDoS attacks to access the control of IT industries or user computers for spoofing.
Phishing	Counterfeit web pages that duplicate legitimate business web pages to elicit financial, personal, or other private information from the users.
Spam URLs	Websites or URLs which are found in spam emails. These webpages often redirect and advertise sex, fraudulent, and other potentially offensive materials to harm the user's computer.
And More	Malicious Websites, Newly Observed Domain, Newly Registered Domain

1.9 Thesis Outline

The thesis is organized as follows -

Chapter 2 reviews related work in the area of web content filtering and the content filtering techniques and models. Also, the methodology and framework of content filtration are reviewed at length.

Chapter 3 focuses on the formulation of the problem. The research problem that is considered in this thesis is stated and defined.

Chapter 4 The fourth chapter elaborated the different Types of Web Content Filtering Mechanism.

Chapter 5 The fifth chapter will with the objective-wise analysis of data, result, interpretation, and detail discussion on findings. The design of a functional model for content filtration suggested at the end.

Chapter 6 The sixth chapter deals with the conclusion, limitations, delimitations, and suggestions for future research.

CHAPTER - 2

REVIEW OF RELATED LITERATURE

The base for new knowledge is always existing knowledge. For the proper resurrection of knowledge, the previous literature has to be adequately reviewed. In the words of Boote & Beile (2005), "A researcher cannot perform significant research without first understanding the literature in the field". The proper collection and analysis of related literature bring consistency in the research work and provides a sound footing for the outcomes. The present problem also needed the analysis of the previous works for better visualization and conceptualization of the problem.

There are many techniques used to filter internet content. All the techniques are designed to use at certain levels of network architecture. Internet filtering is commonly implemented at two levels: **At the ISP's level –** This type of filtration is being implemented by Internet Service Providers (ISPs) at ISP level on the recommendation of the Government and at the international **gateway level –** This type of filtration is being implemented at the international gateway where the internet traffic of the entire ISP's routed. The uniform and unique filtration achieved at this level across the different ISP's. The reviewed studies have been classified into various sections for a better understanding of the problem. Based on an extensive and comprehensive review, the significant themes evolved are as following which are used in both types of filtering levels, i.e., ISPs level, and International gateway level -

2.1 Types of Filtering Technique

I. URL Filtering
II. Keyword Filtering
III. HTTP Proxy Filtering
IV. Browser Based Filtering
V. IP Filtering
VI. DNS Filtering
VII. Packet Level Filtering
VIII. Circuit Level Filtering
IX. Application Level Filtering
X. Image/ Pixel Based Filtering

I. URL Filtering – A commonly used web content filtration mechanism is URL (uniform resource locator) filtering, which prevents the web access of the user by

checking the requested URL against the standard URL database. This allows the network administrator to make decisions about the content categories. It uses two types of lists of websites, namely white list and blacklist and most filtering solutions using URL filtration based on the web categories classified in the blacklist and white list. However, this filtration mechanism is not only time consuming but also an expensive one and largely depends on an administrator's decision and hence can't be treated as an independent content filtration mechanism (Vicks, 2013).

The study conducted by Pakistan Telecommunication Authority in 2011 on Web and Content Filtering in Pakistan identifies the pivotal role of ISP's in URL filtering. It also communicates china as an exceptional case having thousand or more ISP's but having one of varies rigorous policies and mechanisms for URL filtering. Most of the URL filtering solutions used world-wide are largely dependent open the respective internet services providers, and many such services are paid services, especially in western countries to enterprises and end-users.

In 2013, a study for identifying and confirming the user of IRL filtering products for web censorship was conducted by Dalek *et al*. The study was conducted for identifying installations of URL filtering products and there use for censorship. The result of the conducted study showed that several URL filtering products are extensively used to block a range of content available over the internet. The research also outlines that web filtering mechanism through ISP requires which categories to be blocked in each ISP.

URL filtering prevents or allows Web access by checking a requested Web site's URL against a URL database that is categorized according to content (Sutton, 2012). Categorization allows network administrators to make blocking decisions based upon content categories. There are two types of URL databases—a blacklist database that contains URLs of objectionable Web sites and a white list database that contains URLs of acceptable Web sites (Chou *et al.,* 2010). Most filtering solutions that employ this technique uses blacklists (Hidalgo *et al.,* 2009). This blocking method can be configured to block entire URLs or only permit access to no- offensive content on the Web site. As with keyword blocking, vendors usually provide a primary URL database requiring the user to perform manual updates. Updates must be performed frequently to keep pace with rapidly expanding

Internet content; otherwise, an institution's URL blacklist could easily fall out of compliance with its AUP (Nicoletti, 2009).

Experts of web filtering techniques say that this type of filtering is time-consuming and resource-intensive since most URL blocking systems enlist human reviewers to maintain updated URL lists. Filter developers are increasingly using automated tools to improve the updating process. Automated Web spiders tag potentially offensive sites while human reviewers follow-up to validate the automated classifications (Hidalgo *et al.*, 2009; Houghton-Jan, 2010). Nevertheless, creating and maintaining URL databases continues to be a labor-intensive and expensive process (Banday & Shah, 2010; Chen & Wang, 2010). Therefore, commercial filtering companies typically not reveal specific Web sites by category because the information is proprietary or a trade secret (Gossett & Shorter, 2011); Houghton-Jan; Willard, 2010b).

As speed and accuracy are critical attributes of sound filtering systems, most commercial and open-source Web filters use URL filtering as the primary filtering technique. Koumartzis and Veglis (2012) suggest that URL filtering technology is more comfortable to implement, and its fast processing speed supports implementation on a massive scale, such as in school districts with distributed locations. However, an inherent fault of site blocking is its focus on HTTP-based traffic, which fails to detect and block instant messaging, email attachments and file-sharing applications that may threaten network security. Therefore, most public schools use commercial filtering products that employ a combination of filtering techniques to achieve more meaningful content blocking effectiveness (Chou *et al.*, 2010; Nicoletti, 2009).

II. **Keyword Filtering:** Keyword filtering matches the search string (keyword) with the keyword database. Keyword database stores the different keywords information and listing of websites having the same keyword. If the search string keyword matched, then all the websites containing that keyword get blocked. This filtering technique works with the text words due to that it adds minimal load on the systems in terms of computation and speed. Through Keyword filtering, no images can be analyzed. Through the help of Keyword filtering, anyone can easily set up rules that filter the content with a particular keyword or a combination of the keyword in the search body or subject (https://manuals.gfi.com).

III. **HTTP Proxy Filtering:** Hyper-Text Transport Protocol (HTTP) is the protocol through which Web pages travel. Another method of filtering involves using *proxy servers* or *Web proxies*, which analyze and possibly modify HTTP content as it travels between computers and the internet. The filtering mechanism redirects the user request through the proxy server (Scott & Melgosa, 2013, p.56). It is an alternative way not to allow users to connect directly to the website but force or encourage all users to access Web sites via a proxy server. However, as well as to improve performance, an HTTP proxy can also block Web sites. The proxy decides whether requests for Web pages should be permitted and if so, it sends the request to the Web server hosting the requested content (Murdoch & Anderson, 2008, pp.61-62).

IV. **Browser-Based Filtering:** Content Filtering is a new subject in the area of technology. That needs the study in depth. This actual issue consequences for the variety of media and advertisements on the internet web sites that lead to unethical and misuse of Web users (Karthikeyan, 2014, p.203). In which browser-based end-user content filtering solution is the most lightweight and easy solution to do the web content filtering and is implemented via a third-party browser extension software or tools (Karthikeyan, 2014, p.204). The browser-based filtration is performed through add-ons, approving a website with digital certification, or enabling custom parental controls individually. Pixel-based algorithms to identify the obscene content are highly used in browser-based filtering.

V. **IP Filtering:** Internet Protocol blocking is a security filtering that stops the transfer of protocols between two or more targets or servers. This type of filtration is applied to block undesirable or unwanted sites and hosts that hack, postpone, or harm the network or machine. The industries or companies mainly use IP blocking for preventing the invasion of viruses or harmful software or data. It limits the range of websites that are accessed by the persons for official purposes. Educational institutions also use IP blocking type of filtration to protect against unauthorized access of confidential data. Ferguson and Senie (1998) observed that a rebirth of rejection of service attack aimed at various targets in the networking had produced new challenges. While blocking any IP address, all the shared hosted websites associated with that IP gets blocked by default, which misleads the main objectives.

VI. **DNS Filtering:** The Domain Name System (DNS) is an essential part of the internet. The primary purpose of DNS is to resolve symbolic domain names to IP addresses (Son & Shmatikov, 2010, p.466). Each DNS resolver or authoritative server stores Resource Records in its cache or its local zone file. A Resource Record (RR) includes a label, class, type, and data. The label of an RR is a symbolic domain name used when accessing an internet resource (Khan, 2015). DNS tampering is achieved by DNS servers forge lookup records, which resolve a domain name into IP addresses. While blocking the access to a particular website, the DNS servers are configured to return the fake IP address. While this allows the blocking of a specific website, it also can be easily manipulated by simple means such as accessing a website through its IP address directly or by configuring the computer to use a different DNS server (Deibert *et al.*, 2008, p.14).

VII. **Packet Level Filtering:** TCP/IP Filtering works mainly at the network layer to inspect the information packets, including source IP address, source port, destination IP address, destination port, and the protocol used. Based on the packet and rules, the packet may be dropped or granted and may forward the information to the network administrator. It is used at the router level as an additional security layer. In the field of network security, the packet level filtering is the way to proceed. This stream functionality is the critical aim of most of the non-commercial and commercial security tools. Therefore, if anything comes to the internal network, it passes through the network security filters. Any type of outgoing content also passes through the security filters/security walls before leaving the network entirely. Due to this property, the packet level filtering is also called as screening level filtering. The bigger problem with packet-level filtering is that it can be hacked easily by a hacker using the spoofing process.

VIII. **Circuit Level Filtering:** Circuit level filtering is another type of security wall which works at the session layer through providing a more general type of security. Circuit level filtering acts as a relay for TCP connections. They interrupt TCP links, which provide the facility for the host to work behind and a complete three-way handshake on behalf of that host and determine the authenticity of a requested assembly by monitoring the handshake between packets. The circuit-level filter can hide the outside network. It also restricts the network rules to public computers. Usually, the circuit-level filter is economical than other protective filters. The main drawback of this type of filter is that every packet

cannot be detected due to more general things in contemplation of filtering the packets.

IX. **Application Level Filtering:** Application-level filtering refers to vulnerabilities inherent in the code of a webpage or web-application itself (irrespective of the technology used in which it is implemented the critical security of the web-server and back-end database on which it is built) (Scott & Sharp, 2003). Application-level filtering is demanding and most secure type filtering. But it has a lengthy cost of the process. Because in this type of filtration, at every filtration layer, a new session of the process starts. This type of filtering works at the application layer and is protocol specific. It is also called as proxy filtering.

X. **Image Detection/ Pixel Based Filtering:** It is a self-evident truth that nowadays, the internet is contaminated with porn content (Castleman, 2016; Kessler, 2017). The majority of adults in our society, both men and women, have been exposed to very explicit materials. Numerous researches have been conducted to make sure whether the pornographic contents should be blocked (Fu & Wang, 2011), the mechanism of blocking these content (Kumar, 2016), the detection mechanism of these contents (Sengamedu, Sanyal & Sathish, 2011; Sukthankar & Baluja, 2016), the effect of pornographic content on young minds (Perry, 2016; Kelly, 2017; Quadara, El-Murr & Latham, 2017) and module for the same. Most of the researches conducted in the field were related to image detection and identifying unsolicited content. A research was conducted by (Tello-Flores, Colmenares-Guillén & Niño-Prieto, 2011) on the topic of "*Approach of RSOR Algorithm Using HSV Color Model for Nude Detection in Digital Images*" The research's main objective was the development of RSOR algorithm as an application for nudity detection in digital images. In this research, the algorithm utilizes a combination of techniques to build some systems that permit tracking and detecting pornography on the internet. (Kasaei, 2005) revealed in his research entitled "Pixel-Based Skin Detection for Pornography Filtering" that 21 color spaces have been examined in all their possible representations for pixel-based skin detection in pornographic images.

XI. Consequently, this research holds an extensive investigation in the field of skin detection, and a specific run on the pornographic images. (Basilio *et al.*, 2010) concluded that some programs in the foreign market allow blocking sites on the internet with offensive or explicit content such as Cyber Patrol, Content Protect,

Net Nanny, Family.net, and K9 Web Protection. All these software provide parental control to safeguard their children using the internet. There exist some other programs which detect pornographic images within the computer such as Surfrecon that offers a software program for this purpose, Paraben's Porn Detection Stick is another software, the company Access Data offers a software solution for informatics forensic call Forensic Toolkit (FTK 3.1), this software has a tool FTK Explicit Image Detection for this use. Hence, (Chan, Harvey & Smith, 1999) suggested for "Building systems to block pornography" in this research the refinement and extension of the training and test databases. After collecting a much more extensive database of over one thousand images, the images were classified into some additional categories such as "fashion" and "logos," which may have special significance also.

The recent emergence of image processing mechanisms may also be an effective content filtration mechanism as the volume of images and multimedia content has been increased to a more considerable extent. It is superior then text-based content filtration. One can say where text-based processing fails image processing works effectively, mainly when the webpage includes multimedia content. However, some studies like Sutton 2012 and Chmara 2010 found that image processing sometimes can't accurately block visual pornographic materials.

Another content filtration mechanism rarely being used is content labeling, which controls the content by itself. It is designed to control the content when a particular website is being developed. In content labeling, webmasters are not required to prepare a database for labeling the content. The bigger problem with content labeling is that it is not regulated, and therefore a wrong label of pornographic content could not be filtered. Research and exploration needed in using content labeling as a web content filtration mechanism (Vicks, 2013).

Image processing continues to be an active filtering research area because of the ever-increasing volume of images and multimedia on the internet, and mainly since pornographic images are what CIPA stipulates must be filtered. Most commercial filtering tools classify Web content as pornographic or safe, using text on the Web page. However, text-based processing is not valid with Web pages containing mostly images and minimal or obfuscated text (Chen & Wang, 2010). Image filtering, based on skin detection, is an emerging technique with a high

degree of accuracy, but the slow performance makes this technique unusable in real-world systems. Consequently, most filtering systems employ moment analysis, textures, histograms, and statistics to produce an algorithm that Hidalgo *et al.* (2009) purport to be highly effective in recognizing pornographic images.

2.2 Need/ Reason for Filtering

It is well documented that watching unsolicited content (pornographic content) has a very adverse effect on the whole society, especially to the young mind. A research study conducted by scientists from the Gregorio Marañón University Hospital in Madrid and the Network of Centers for Biomedical Research in Mental Health Networks (CIBERSAM) shows that adolescents experiencing an outbreak of psychosis have a lower level of grey matter observed in their brains than healthy teenagers. This change was observed in patients suffering from various psychoses, including bipolar illness and schizophrenia. A study done by one of the well-regarded researchers in the field found that "high consumption of pornography consumption added significantly to the prediction of sexual aggression" (Kühn & Gallinat, 2014). It is also added that a lack of grey matter in the brain is linked to schizophrenia and bipolar disorders.

It is unfortunate enough that, at present, there is no full-proof mechanism to block/control all these unsolicited/unwanted contents immediately on the network level. In case of any communal anarchy, any rumor reaches to target people very fast which causes the immediate disturbance of peace.

In September 2006, a military-led coup in Thailand over returns the democratic Government ruled by Prime Minister *Thaksin Shinawatra*. Thailand is not unfamiliar with such upheavals. There have been approx seventeen coups in the past years. However, this time internet users noticed a marked increase in the number of web sites that were not accessible, including several sites critical on the military coup. In Nepal, the king forcefully shut down the internet along with international telephone lines and mobile communication networks when the government power seized from the parliament and prime minister. In Bahrain, during the run-up to the 2006 election, the Government chose to block access to several crucial opposition parties. The organized events are part of a growing global trend worldwide. Claiming control of the internet has come to an essential element in any government strategy to rein in dissent – the twenty-first century parallel to taking over television and radio stations. In resist of these exceptional events, the continuous blocking of a swath of the internet has become part

of the daily routine political and cultural activity of many states. An increasing number of countries are blocking pornographic websites, led by a handful of states in the Persian Gulf region. Rest countries, including South Korea and Pakistan, block web sites that comprehend as a threat to national security issues (Faris & Villeneuve, 2008, p.45). Indiscriminate Internet surfing is a significant cause of entry for viruses, worms, Trojans, spyware, keyloggers, phishing, pharming, and more. Notwithstanding, there are mostly three motives or rationales for internet filtering: political filtering, social filtering, and security/ conflict filtering.

Therefore, a robust and powerful network architecture plan and different kinds of system algorithms (Network Level, Session Level, Application Level, etc.) are required to detect and control/block/monitor unsolicited/ unwanted content over the web. Once any kind of network architecture & algorithms is implemented, it can control/block/monitor any kind of specific content in a particular geographic area as and when needed. Therefore, a much more intelligent system equipped with different levels of control is required to avoid the shortcoming described above of present web content filtration (WCF) mechanisms. The following diagram expresses the motives of present Web Content Filtration practices.

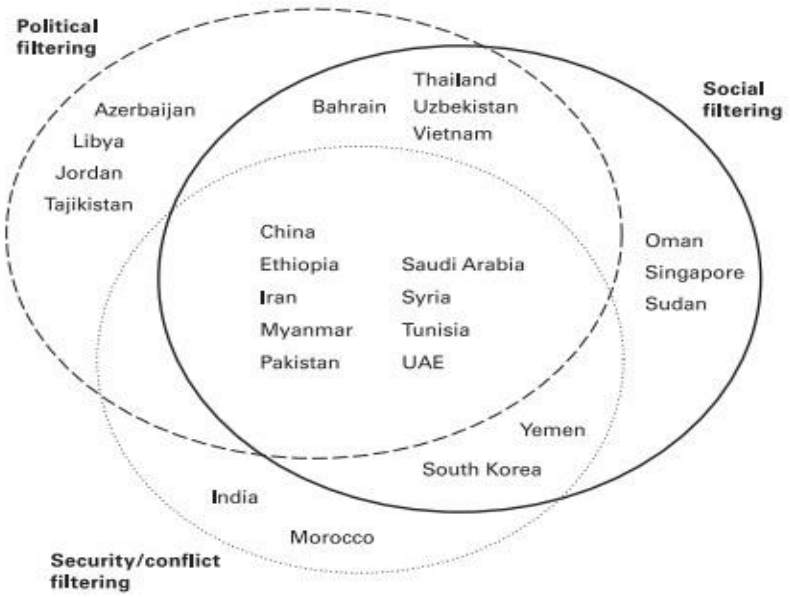


Figure - 2.1 : (Motives of Content Filtering; Source: Zittrain & Palfrey, 2008 p.26)

2.3 Pornography: the Dark Statistics on Internet

In Britain, Prime Minister David Cameron announced a plan to filter online pornography by default for households in U. K., **saying the initiative is about protecting children and their**

innocence (Peterson, 2013). On the other side, Jerry Barnett (the founder of campaign group Sex & Censorship) gave an idea that the legislation soon changes the internet fundamentally in the UK and globally (Burgess & Clark, 2018). The statistics on internet pornography illustrated the magnitude of the industry & its potential for social impacts. It is estimated to be a $3 billion annual industry nearly fifteen percent of total websites about 4.5 million having pornographic content; over twenty percent of total search engine requested are for pornography; 35 percent of download (over 1.5 billion per month) is pornographic, and over 75 million people annually visit porn websites. The vast consumer of internet pornography is the 12 to 17 age group, and 90percent of 8 to 16-year-olds have viewed pornography online, mostly when they do their homework (Quinn & Forsyth, 2006). Internet and mobile association of India revealed at the end of June 2014, the internet user base in India reach about 243 million and a year on year growth of 28 percent with a projected user base of approx 330 million to 370 million by 2015, which would be the second-largest in the world (Gnanasambandam *et al.*, 2012). Owens *et al.* (2012) opined that with the growth of the internet has come more accessible and more ubiquitous access to pornography. The rapid proliferation and mainstreaming of pornography over the last two and half decades, primarily through online ways, have influenced adolescent culture and development in unexampled and diverse ways.

The internet has become a global communication medium and people of all age groups (kids - adults) to use it for their needs for computing, communication, and, more importantly, reading, learning & teaching (Karthik *et al.*, 2013). Whenever a search engine receives a query, it retrieves results from a catalog of webpages called an index. Each search engine has its index, and the major search providers add and remove webpages from their indexes regularly to keep them up to date (Stark, 2007, p. 6). Content Filtering is a new subject in the field of technology. That has to study in-depth. This issue appears as consequences for the variety of media and advertisement on an internet web site that leads to unethical activity and misuse of World Wide Web users (Karthikeyan, 2014, p. 203).

2.4 Internet and Pornography

With the increase of offensive content viz. violence, pornography, misconduct, mischief, suicide games, etc. available on the internet, practical techniques and framework needed to inspect and block / control unsolicited online content. Some researchers have focused on developing Honey Pot for spam identification (Saini & Murugappan, 2014, p. 2136). These

unsanctioned materials are also a big challenge in terms of technical, legal, and educational aspects. It is need of the hour to make information retrieval from the internet safe and credible (Willard, 2010). Most of the existing web content filtering software, which is aimed to block and filter unwanted web contents, have the main drawback that user have to enter the website address, which wants to block. It doesn't provide the username and password to control it, like in Net Protector (Kharad & Kulkarni, 2015, p. 247).

2.5 Internet and Effect of Pornography: A Review

We live in a technology-rich world (Van Dijck, 2013). Children and young minds use of the internet are commonly spoken about as a balance of risk and opportunity with the focus on risk mainly featuring in the literature about young people's digital lives (Kirwil & Laouris, 2012, pp. 113-126; Nansen *et al.*, 2012). Today, the internet is useful for children and youth as well as in the field of education, psychology, and human development, in addition to presenting new challenges in law and policy (Lee & Crofts, 2015; Stone, 2011). Reliable evidence shows that in adolescents, the use of porn content is associated with more robust indulgent sexual behavior. Research suggests that the behavior and practices in pornography can influence expectations about sex, which can cause anxiety and fear. Thus, gaps between expectations and reality can produce "sexual uncertainty" about sexual beliefs and values (Quadara, El-Murr & Latham, 2017, p. 11). Flood (2009) noted that exposure to pornography is routine among children and young people, with a range of notable and often troubling effects and may cause disturbing and upsetting. He argued that while there are variances over how to judge pornography's effects, pornography exposure can lead to various types of emotional disturbance, sexual knowledge and liberalized attitudes, shifts in sexual behavior, and sexist and objectifying understandings. Particularly for boys and young men, the use of pornography may aggravate violence supportive social norms and encourage their unconscious participation in sexual abuse.

Australian Bureau of Statistics defined children of the 21st century as the digital generation. It means *children who don't know life without a computer or the Internet* (Australian Bureau of Statistics, 2011, p. 1). In this sense, today's world is looking at the future of the second-generation digital Age (Orlando & Attard, 2016). Cultural wealth inspires children's physical growth, ideology, and education outcomes (Roger, 2006; Andersen & Jaeger, 2015). It is known that digital literacy is an earned skill of comprehensive understanding and experience

of making meanings using digital platforms and in digital environments (Burnett & Daniels, 2015, p. 19).

Regarding this concern, Advocate Kamlesh Vaswani filed public interest litigation (PIL) in the supreme court of India by outlining the unfathomable scenario of the freely available porn content, mainly child pornography online, about Delhi rape case and seeking directions to take corrective measures. This PIL states that most of the sexual crimes against women are a result of extensive access to pornography by the offenders (Dev, 2014). On that reaction, the *Department of Electronics and Information Technology* of Government of India had ordered Internet Service Providers (ISPs) to block 857 porn websites and planned to put an ombudsman to control cyber content-related issues (Press Trust of India, 2015; Alawadhi & PK, 2015). Blocking undesirable content is technically and never wholly successful (Paul, 2008, p. 4). Because unbound cost and access to resources are needed for adequately determining undesirable content on the internet, it is also impossible and impracticable to keep the list of undesirable content up to date for all stakeholders aside from the end-user (Paul, 2008, p. 4).

Now a day's children are involved in a wide range of activities supported by the internet. The study of European-Union kids online reveals that ninety two percent of kids are involved in schoolwork, eighty three percent are involved in playing games, seventy five percent are involved in watching a video, and seventy one percent of kids are involved in social networking. As the data indicates, there is a high risk for children to get indulged in unwanted and unsolicited content over the internet if they are not being provided with the filtered content over the internet.

In a study in England, it was found that out of total primary schools in England, three percent of primary school children were accessed adult websites further. The study suggested that six percent of children below the age of fifteen had access to porn material. The data points out the need for effective policy and filtration mechanisms.

2.6 Internet Censorship Worldwide

Open Net Initiatives (ONI) principal investigator says "Originally and probably still to a large extent, pornography is most widely targeted content and also the one that's justified the most by countries. Most countries, if they're going to engage in internet censorship, start by talking about a broad category of inappropriate content. But what we've found over the last decade is

the spectrum of content that's targeted for filtering has grown to include political content and security-related content, especially in authoritarian regimes. The scope and scale of content targeted for filtering has grown".

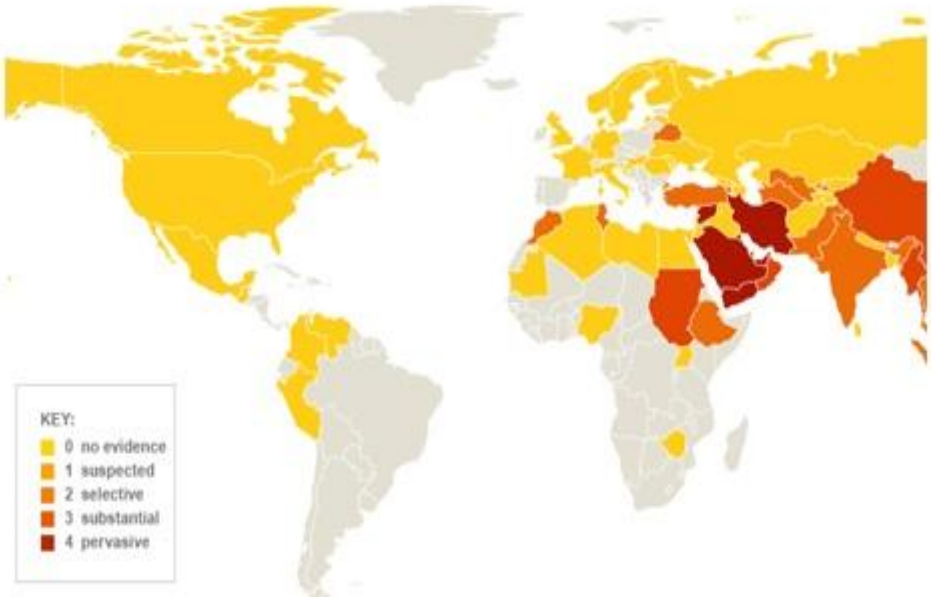


Figure - 2.2 : Internet Censorship Comparison: Country Wise

(Source: https://www.theguardian.com/technology/datablog/2012/apr/16/internet-censorship-country-list#data)

Table - 2.1 : ONI Worldwide Ranking : Internet Censorship

Country	Political filtering	Social filtering	Internet tools filtering	Conflict/security filtering
United Arab Emirates	substantial	pervasive	pervasive	Selective
Afghanistan	no evidence	no evidence	no evidence	no evidence
Armenia	substantial	selective	selective	Selective
Australia	no evidence	no evidence	no evidence	no evidence
Azerbaijan	selective	selective	no evidence	no evidence
Bangladesh	no evidence	no evidence	no evidence	no evidence
Bahrain	pervasive	pervasive	substantial	Selective

Belarus	selective	selective	selective	Selective
Canada	no evidence	no evidence	no evidence	no evidence
China	pervasive	substantial	substantial	Pervasive
Colombia	no evidence	selective	no evidence	no evidence
Germany	no evidence	no evidence	no evidence	no evidence
Denmark	no evidence	no evidence	no evidence	no evidence
Algeria	no evidence	no evidence	no evidence	no evidence
Egypt	no evidence	no evidence	no evidence	no evidence
Ethiopia	substantial	selective	selective	Selective
Finland	no evidence	no evidence	no evidence	no evidence
France	no evidence	no evidence	no evidence	no evidence
United Kingdom	no evidence	no evidence	no evidence	no evidence
Georgia	selective	no evidence	no evidence	Selective
Guatemala	no evidence	no evidence	no evidence	no evidence
Croatia	no evidence	no evidence	no evidence	no evidence
Hungary	no evidence	no evidence	no evidence	no evidence
Indonesia	selective	substantial	selective	no evidence
Israel	no evidence	no evidence	no evidence	no evidence
India	selective	selective	selective	Selective
Iraq	no evidence	no evidence	no evidence	no evidence
Iran	pervasive	pervasive	pervasive	Substantial
Italy	no evidence	selective	no evidence	no evidence
Jordan	selective	no evidence	no evidence	no evidence
Kyrgyzstan	selective	selective	no evidence	no evidence
South Korea	no evidence	selective	no evidence	Pervasive

Kuwait	selective	pervasive	pervasive	Selective
Kazakhstan	selective	selective	no evidence	no evidence
Laos	no evidence	no evidence	no evidence	no evidence
Lebanon	no evidence	no evidence	no evidence	no evidence
Sri Lanka	no evidence	no evidence	no evidence	no evidence
Latvia	no evidence	no evidence	no evidence	no evidence
Libya	selective	no evidence	no evidence	no evidence
Morocco	no evidence	selective	selective	Selective
Moldova	selective	no evidence	no evidence	no evidence
Burma (Myanmar)	pervasive	substantial	substantial	Substantial
Mauritania	selective	no evidence	no evidence	no evidence
Mexico	no evidence	no evidence	no evidence	Selective
Malaysia	no evidence	no evidence	no evidence	no evidence
Nigeria	no evidence	no evidence	no evidence	no evidence
Norway	no evidence	no evidence	no evidence	no evidence
Nepal	no evidence	no evidence	no evidence	no evidence
Oman	selective	pervasive	substantial	no evidence
Peru	no evidence	no evidence	no evidence	no evidence
Philippines	no evidence	no evidence	no evidence	no evidence
Pakistan	selective	selective	selective	Substantial
Gaza and the West Bank	no evidence	substantial	no evidence	no evidence
Qatar	selective	pervasive	pervasive	Selective
Romania	no evidence	no evidence	no evidence	no evidence
Russia	selective	selective	no evidence	no evidence

Saudi Arabia	substantial	pervasive	pervasive	Selective
Sudan	selective	substantial	substantial	no evidence
Sweden	no evidence	no evidence	no evidence	no evidence
Singapore	no evidence	selective	no evidence	no evidence
Syria	pervasive	selective	pervasive	Selective
Thailand	selective	selective	selective	no evidence
Tajikistan	selective	no evidence	no evidence	no evidence
Turkmenistan	pervasive	selective	selective	Selective
Tunisia	no evidence	selective	selective	no evidence
Turkey	selective	selective	selective	no evidence
Ukraine	no evidence	no evidence	no evidence	no evidence
Uganda	no evidence	no evidence	no evidence	no evidence
United States	no evidence	no evidence	no evidence	no evidence
Uzbekistan	pervasive	selective	selective	Selective
Venezuela	no evidence	selective	no evidence	no evidence
Vietnam	pervasive	selective	substantial	Selective
Yemen	substantial	pervasive	pervasive	Selective
Zimbabwe	no evidence	no evidence	no evidence	no evidence

In the study different state level internet censorship has been taken in to the consideration for review. The report carried out the empirical study of 45 counties Internet filtering and describes the trends in the fields of political, social, technological domain and state of Internet freedom. The evidence of filtering found only 26 countries out of 45 countries. While summarizing the result the authors evaluated each country on the ground of politics, social content, conflict / security and Internet tools and divided the degree of filtering in to the following levels (Clark *et al.*, 2017) –

- Pervasive filtering represents the high degree of filtering results while blocking vast categories of related content.

- Substantial filtering represents the medium level of filtering while blocking limited categories of related content.
- Selective filtering represents the narrow level of filtering that block a less number of websites across few categories of filtering.

	Political Content	Social Content	Conflict/Security	Internet Tools
Bahrain	••	•••	••	••
China	•••	••	•••	•••
Egypt	••	--	•	•
Hungary	--	•	--	--
India	••	•	••	••
Indonesia	•••	•••	•	•••
Iran	•••	•••	•••	•••
Kazakhstan	••	•	--	•
Kuwait	••	••	••	••
Lebanon	--	•	--	--
Malaysia	••	••	--	•
Oman	•	•••	•	••
Pakistan	•	•••	•	•••
Palestinian Territory – West Bank	•	--	--	--
Qatar	•	•••	•	•••
Russia	••	•••	•••	••
Saudi Arabia	•••	•••	•••	••
Singapore	•	•	--	--
South Korea	••	••	•••	•
Sudan	--	••	--	•
Syria	•••	--	••	••
Thailand	••	••	--	•
Turkey	••	••	•••	•
United Arab Emirates	•••	•••	•••	•••
Uzbekistan	••	•••	•••	••
Yemen	•••	•••	•••	•••

••• Pervasive filtering; •• Substantial filtering; • Selective filtering; -- No evidence of filtering

Figure - 2.3 : Degree of Internet Censorship: Country Wise

2.7 Content filtering v/s Content Blocking

The discussion about *internet* or *web content filtering* has always been conveyed by censorship and privacy concerns, which have shown that filtering technologies are one of the tools used by governments to restrict access to inapt Internet content (Noll & Meinel, 2005, p. 2). While in *internet content blocking*, parts of the internet can't be accessed (Internet Society, 2017, p. 5). Content filtering was developed in response to the ineffectiveness of content blocking. It uses artificial intelligence to analyze and assess the content of a web page and respond by either providing or restricting access to the web page, or part of the web page (Paul, 2008, p. 13).

2.8 Content Filtering Challenges

Administrators and policymakers have many options and challenges to weigh when selecting a filtering solution and establishing filtering policies. Increasing online threats from email, chat rooms, peer-to-peer sharing sites, spam, viruses, worms, etc., demand that school districts not only filter objectionable Internet content, but also content that could subject the network to the threats as mentioned earlier (Thomas & Stoddard, 2011). Additionally, filtering policies must combat non-educational use, bandwidth-consuming content, legal liability, and security breaches (Hidalgo *et al.*, 2009; Nicoletti, 2009). Address these challenges. The latest security solutions combine security functions such as firewalls, antivirus protection, Web content filtering, anti-spam, spyware prevention, intrusion detection and prevention, Internet Protocol security, and bandwidth management. These security solutions, also known as unified threat management (UTM) appliances, dynamically control Web traffic at the organization's gateway providing an inline examination of Web content, SSL traffic, Web 2.0 applications, and various network protocols to classify dynamic content in real-time (Ramaswami, 2010; Enex Testlab, 2011). For most school districts, the greatest challenge to the implementation of this type of security appliance is cost. Consequently, schools are dependent upon traditional filtering software, which typically blocks entire sites instead of dynamically scanning Web sites to block inappropriate content and allow appropriate content.

China's Internet filtering regime is a sophisticated effort of its kind compared to similar efforts in other countries; China's filtering system is vast, refined, and more effective, and there are multiple levels of legal regulation and technical control over the network and its content. Across the world, only China has completed a Golden Shield Project, often referred to as the great firewall of china somewhat similar to the Great Wall of China, controlling the accessibility. As per the sample test and results on http://www.greatfirewallofchina.org/, it is surprising not even google.com and facebook.com are allowed to surf in china. China does not permit any kind of outside intervention that may leak recent technology and R&D of China. (Deibert, 2012).

2.9 Country-based mechanism of Web Content Filtration

For setting up the standards of web filtration, it becomes necessary to review the existing practices across the globe. If we extensively review the literature, it may be concluded quite quickly that this does not imply to all the countries. Various countries are also up to the debate on whether filtering the content is required or not. There are two opinions about this issue. The first opinion clearly says that the internet filtering mechanism needed severely, whereas the second group of scholars options that any type of policing results in various bad things. However, the researcher not be trapped in this debate whether filtering is ethical or not, but a brief account of countries who are involved in filtering the internet content help in understanding the global phenomena. The following table describes the smooth process of filtering internet content.

Table 2.2 : Filtering Status by State

Evidence of filtering	Suspected filtering	No evidence of filtering
Azerbaijan	Belarus	Afghanistan
Bahrain	Kazakhstan	Algeria
China		Egypt
Ethiopia		Iraq
India		Israel
Iran		Kyrgyzstan
Jordan		Malaysia
Libya		Moldova
Morocco		Nepal
Myanmar		Russia*
Oman		Ukraine
Pakistan		Venezuela
Saudi Arabia		West Bank/Gaza
Singapore		Zimbabwe
South Korea		
Sudan		
Syria		
Tajikistan		
Thailand		
Tunisia		
United Arab Emirates		
Uzbekistan		
Vietnam		
Yemen		

(Source: Faris & Villeneuve, OpenNet Initiative p.6)

In this section of the review, the researcher tries to accomplish the fundamental mechanism of internet filtering available across the globe. There are many techniques/mechanisms used to block access to internet content. Each of these techniques is used at various levels of internet access within a country. As we have already discussed that the most commonly used

internet filtering is available at two levels-

I. At the ISP's within the country
II. On the internet backbone of the international gateway

Nevertheless, these methods may overlap. There are some principle techniques used for internet filtering, including IP Blocking, DNS Tempering, and Proxy Based Blocking methods. Here researcher is providing the table of some country's blocking techniques table.

Table 2.3 Measuring Global Internet Filtering

	IP blocking	DNS tampering	Block page	Keyword
Azerbaijan	X		X	
Bahrain		X	X	
China	X			X
Ethiopia	X			
India	X	X		
Iran			X	X
Jordan	X			
Libya	X			
Myanmar			X	
Oman			X	
Pakistan	X	X		
Saudi Arabia			X	
Singapore			X	
South Korea	X	X	X	
Sudan			X	
Syria			X	
Thailand			X	
Tunisia			X	
United Arab Emirates			X	
Uzbekistan*			X	
Vietnam		X	X	
Yemen			X	X

Blocking behavior included in this table may include international gateway level filtering, and filtering techniques used by different ISPs.

*In Uzbekistan, the block page does not clearly indicate that filtering is occurring but instead redirects users to a third-party Web site.

(Source: Faris & Villeneuve, OpenNet Initiative p.13)

The table number (3.2) indicates clearly that different countries have gone for opting different techniques to block unsolicited content within the existing framework. As for as India is a concern, the internet service provides an association of India reportedly has sent instructions to ISP's showing how to block by DNS instead of IP. (www.rediff.com/news)

Chandrinos, Androutsopoulos, Paliouras, and Spyropoulos (2000) conducted a study titled 'Automatic Web Rating: Filtering Obscene Content on the Web,' the objective of the study was to develop a method of content filtering using various techniques from language engineering and image analysis. All the study was conducted within a machine learning framework. The combination of different techniques from language engineering image processing and machine learning was found an advantageous content filtration mechanism with high performance in real-time web content filtration.

The study of Thangaraj & Karthikeyan (2014) named 'KT - Grand: An Algorithm for Web Content Filtering' revealed some important web content filtration issues and provided an algorithm termed as KT – Grand for filtering the content in webpage as researches claimed the algorithm is able to make the analysis in the content part of the webpage and could make filtering decision to allow or ban the webpage from the access. In this study, content filtering was considered as a type of firewall to block specific sites from being accessed. Their model of the algorithm based on "An early decision algorithm," which accelerates the filtering process in the web content either by blocking or passing the webpage. The new algorithm was tested on a five web page sample taken randomly, and it was observed that the KT – Grand algorithm is a simple but effective content filtration mechanism. The algorithm did the filtering work in both online and offline content analysis.

Uke & Thool (2012) conducted a study on 'Detecting Pornography on Web to Prevent Child Abuse – A Computer Vision Approach' in this study authors explored several sensitive areas from social ethical and technical perspective and discussed a system for identifying nudity in a video clip browsed on the internet the system employed for this study was named as 'Automated computer vision system' As researchers conceptualized their system consisted of three phases: segmentation, moving object detection and classification phases. The study considered not only visual material but also it has taken in to account audio materials too. Authors concluded that computer vision techniques may be an effective web content filtration mechanism subject to further research and developing a system bases on it.

The study 'Applying deep learning to classify pornographic images and videos' was conducted by Moustafa (2015), in which the researcher used the intelligent image analysis methods to detect and isolate unsolicited content available over the web automatically. The researcher proposed to build a classifier based on deep learning techniques. The author concluded that any web content filtration mechanism developed using deep learning

techniques can be more effective than any mechanism based on convolutional neural networks.

Chernyak (2017) conducted a study on ‘Comparison of String Similarity Measures for Obscenity Filtering' in Russia. The objective of the study was to address the problem of filtering obscene text. The researcher used string similarity measures to find out identical words from a stop list and established a text collection and baseline for the task. Authors concluded that a new string similarity measures based on the notion of annotated suffix tree worked well then other different measures.

Murthy, Woldegiyorgis & Kumar (2016) studied ‘Secured Client-Side Content Filtering Using Machine Learning Algorithms’. The study is a different study that considered client-side content filtering; otherwise, most of such studies considered content filtering from server-side/centralized. They have pointed out two significant drawbacks of the content filtering mechanism. The first is to maintain client anonymity from the content provider and the second the ability to integrates server-side filtration with client-side filtration. Further, they proposed that secures content classification and content filtering to be integrated for a useful filtering mechanism. They succeeded in achieving security by using the identity of the user-generated from the initial point of contact.

The study of Abadpour & Kasaei (2005) titled ‘pixel-based skin detection for pornographic filtering’ considered a different approach for developing a filtration mechanism, which was based on pixel-based skin detection technology currently being used in face detection devices. They tried to employ skin detection technology using different color spaces and their performance for detecting naked persons. In their study, they used 21 color spaces with the ordinary lookup table (OLUT) with the help of these they further developed Baysian lookup table (BLUT) and skin map computation. The study was carried out on 314 sample images resized to 64x64 pixels. The authors conclude that pixel-based skin detection may be used for developing and effective pornographic filtering mechanism subject to further research in the area.

CHAPTER 3

FORMULATION OF THE RESEARCH PROBLEM

3.1 Research Problem

The motivation of the present study derives from the thought if the country like China, can develop such a high quality web content filtration mechanism, then why not it is possible in India? What are the key hurdles in the way of development of web content filtration mechanisms in India? Does the government policies are adequate to support such a mechanism? If not, then what are the lacuna of Indian IT & cyber policies? Does Indian IT infrastructure support such kind of filtering control mechanisms? What is the opinion of Indian IT experts and stakeholders about web content filtration? What are the possibilities of developing a sustainable model for web content filtration of unsolicited content in developing country like India?

It is well researched and proved that watching the unsolicited content (pornographic) has a very adverse effect over the whole society, especially to a young mind. As per the study conducted by scientists from Gregorio Maraón University Hospital in Madrid and the Network of Centres for Biomedical Researches in Mental, Health Networks reveals that adolescents experiencing a first outbreak of psychosis have a lower level of grey matter in their brain than healthy teenagers. Strangely, this change was seen in patients suffering from various psychoses, including bipolar illness and schizophrenia. A study done by one of the well-regarded researchers in the field found that "high pornography consumption added significantly to the prediction of sexual aggression" (Simone Kühn, 2014). It is also added that a lack of grey matter in the brain is linked to schizophrenia and bipolar disorder.

It is unfortunate enough that we don't have any mechanism to block all these unsolicited contents immediately on the network. In case of any communal anarchy, any rumour reaches to target people very fast, which causes the immediate disturbance of the peace. A meeting of the Cyber Regulation Advisory Committee was held on 5th September 2014 under the Chairmanship of Shri Ravi Shankar Prasad, Minister of Information Technology and Communication was held. A writ petition was filed to block pornography website and related content. The petitioner has submitted that convenient access to porn websites results in illegal activities like rape, harassment, molestations of women. It was also communicated that proxy

servers are used to bypass filters deployed by ISPs. It was further added that "https" website with encrypted content is also used to transmit the pornographic material, which increases filtering difficulties as the transferring data is encrypted. Orders for blocking are implemented through internet service providers immediately whenever orders are received for blocking. However, when a vast number of pornographic sites are to be blocked, the latency of the Internet access would increase, which would slow down the Internet (Govt. of India, 2014).

The experts in the meeting expressed that incremental efforts in phases can be considered for implementation for filtering at gateways by upgrading the infrastructure at Internet gateways and distributing filtering software for installation at homes/offices. The present mechanism of blocking the unsolicited contents in India is through ISP end which often fails in proper execution for example recently the case of “Nirbhaya Documentary” is well-known where the government of India (GOI) could not stop the documentary from being uploaded on Youtube streaming site. (Express, 2015)Which clearly and boldly establishes the need for developing some alternate option of network base control of unsolicited contents and take control over the web content?

The report of the meeting and researches both suggests that a different mechanism needs to opt for the immediate blocking of the content. Therefore, a robust and powerful network architecture plan and system algorithms are required to detect and control/block/monitor unsolicited contents over the web. Once any kind of network architecture & algorithms implemented in the country, it can also control/block/monitor any kind of specific content in a particular geographic area as and when needed.

3.2 Statement of the Problem

“Web content filtration algorithm to control unsolicited contents in India”

3.3 Operational definitions of the terms used in the Study

3.3.1 Web Content

In the present investigation, the term ‘web content' refers to the content available over different websites (like web portals, websites, video streaming sites, social networking sites etc.).

3.3.2 Filtration

Filtration refers to the processes which are able to screen out web content based upon specific criteria to make any system fair and healthy. Here the term refers to the process of screening out unsolicited contents available on different web platforms.

3.3.3 Algorithm

Algorithm means a set of defined instructions designed to get the desired output for any system. Presently, the term refers to ‘step by step procedure’ to design for performing an operation in regard to filtering unsolicited contents.

3.3.4 Control

The word ‘control' means to regulate or to monitor any system based on predefined criteria. In the present study, the term refers to regulate or monitor the transmission of unsolicited contents across the defined geospatial locations.

3.3.5 Unsolicited Contents

Unsolicited contents refer to the contents which have no social sanctions. In this study ‘unsolicited contents' mean, the contents related to obscenity, pornography, or any contents which may have a fatal impact on the health of the nation or society.

3.4 Research Questions

i. What are the existing policies in India to control unsolicited contents?
ii. What is the existing web content filtration mechanism in India?
iii. What is the existing network architecture & network framework of ISPs in India?

iv. What could be an effective design of network architecture & algorithms to filter and control unsolicited web contents in India?
v. What could be a sustainable, functional model in regard to filter and control unsolicited web contents?

3.5 Research Objectives

i. To assess the existing policies in India to control unsolicited contents.
ii. To investigate into the existing web content filtration mechanism in India.
iii. To evaluate existing network architecture & network framework of ISPs in India.
iv. To design network architecture & algorithms to filter and control unsolicited web contents in India.
v. To suggest a functional model in regard to filter and control unsolicited web contents.

3.6 Summary

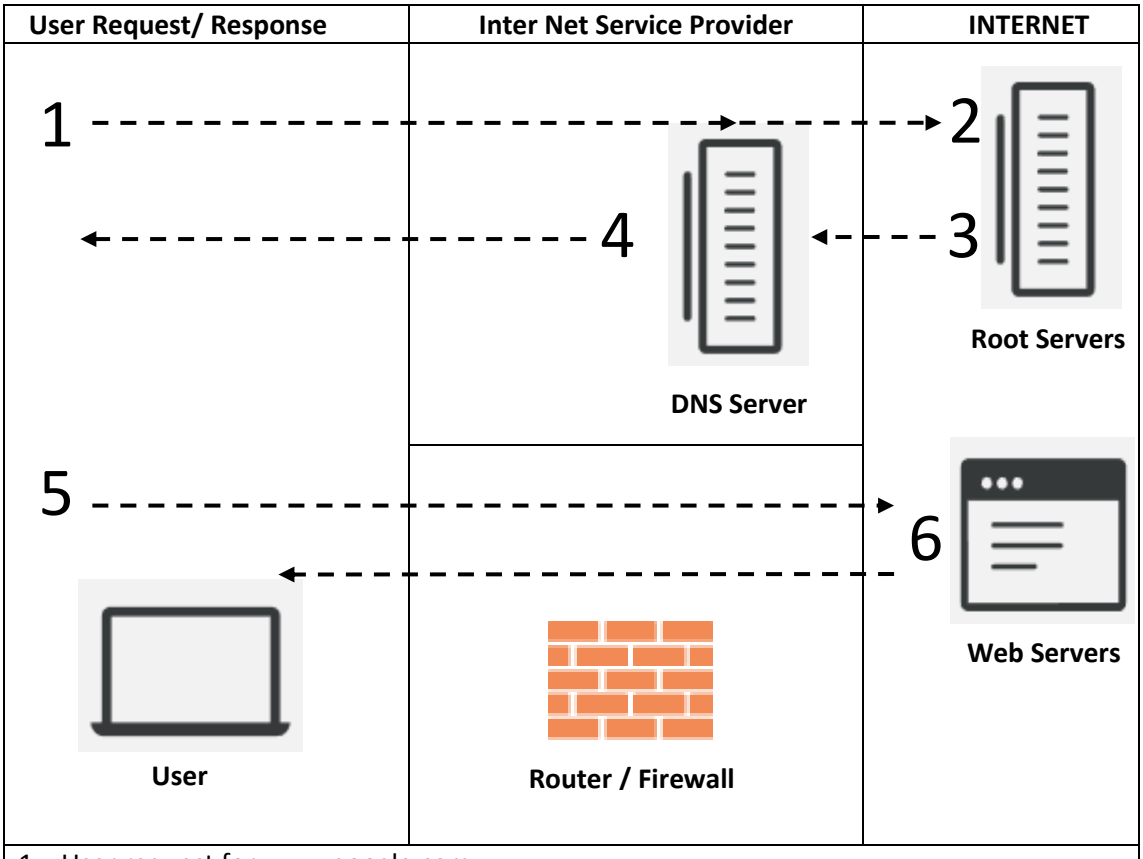
This chapter is deals with formulating the research problem derived from the previous literature survey and which brings out the importance of content filtration. After identification, the research problem addressed in this work is stated and defined. In the next chapter, the objective- vise analysis is taken up with a detailed discussion.

CHAPTER - 4

TYPES OF WEB CONTENT FILTERING MECHANISM

To make the availability of everything on figure tip through mobile devices and apps, it explored the new dimension of technological intervention in the present era. This poses the new challenge to deploy the filtering mechanism at various levels. The results of the filtering mechanism may vary depending on the level of deployments like the Country level, Organizational level, ISP level, and Individual level. The selection of mechanism also depends on the goal of filtering. In India government deploy selective filtering through the ISP end, but it seems ineffective because of the dynamic nature of websites and weak policies of content filtering in particular reference to censorship.

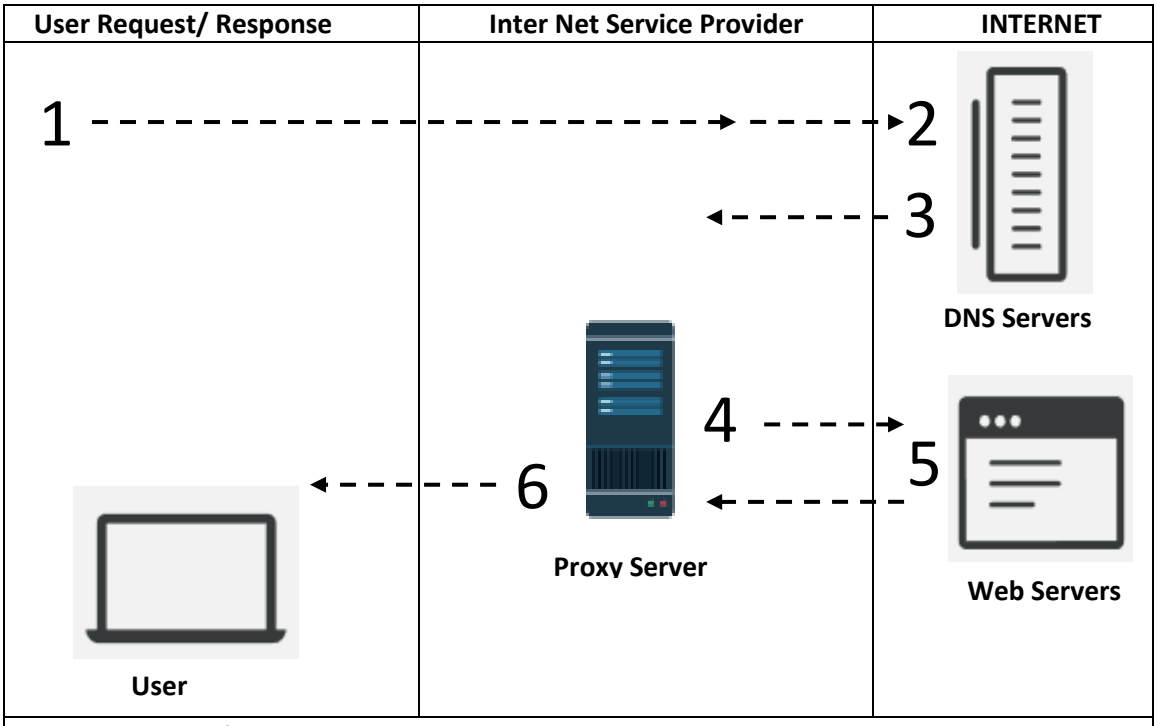
Network Architecture of Web Browsing With Out Proxy Server



1 – User request for www.google.com
2 – DNS lookup for www.google.com
3 – Lookup response www.google.com is 192.168.1.1
4 – www.google.com is 192.168.1.1
5 – Request forwarded to the web server at 192.168.1.1 for web page of www.google.com
6 – www.google.com web page serve to user

In typical web browsing without proxy server user request forwarded to the DNS Server of ISP and further root server till the lookup query not resolved successfully. The user gets the lookup IP response from the DNS server; finally, the user browser initiates the request to the webserver to serve the webpage.

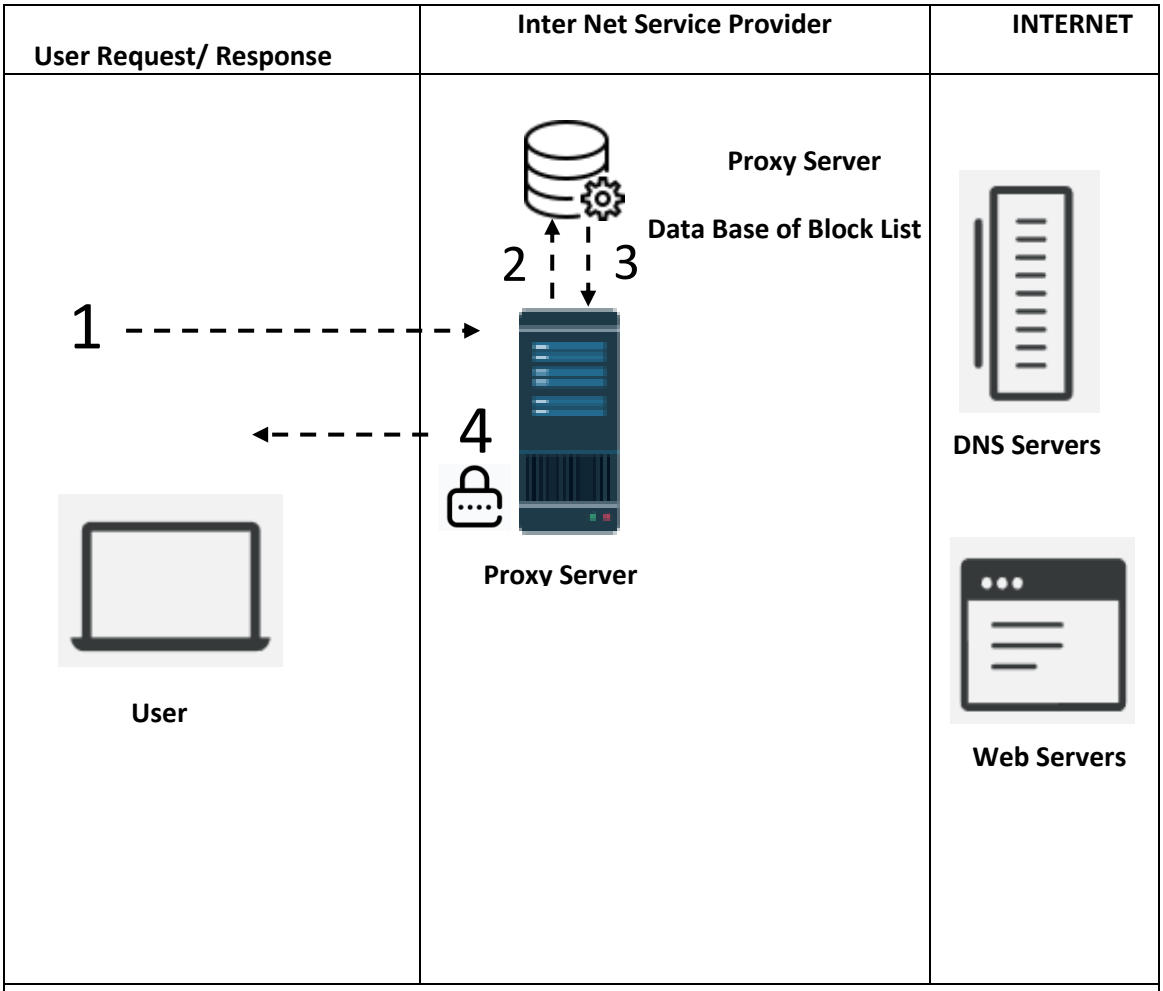
Network Architecture of Web Browsing With Proxy Server



1 – User request for www.google.com
2 – DNS lookup for www.google.com
3 – Lookup response www.google.com is 192.168.1.1
4 – Request forwarded to the web server at 192.168.1.1 to get the web page of www.google.com
5 – Web page of www.google.com forwarded to the proxy server
6 – www.google.com web page serve to user

A proxy server popularly known as a proxy or application-level gateway server, it works as a gateway to cater the user request from the local network to the outside network. In this approach, users are not allowed to directly connect to any websites and force the users to access the websites via a proxy server. The proxy server can cache/store the frequently accessed webpage temporarily. The benefit of this caching technique is that if another user requests the same website, the proxy server serves the user request locally based on the local cache web page. This accelerates the browsing experience of the user. Proxy server with built-in DNS and DHCP service plays an essential role in the user's perspective to get the webpage faster and reduce the latency time.

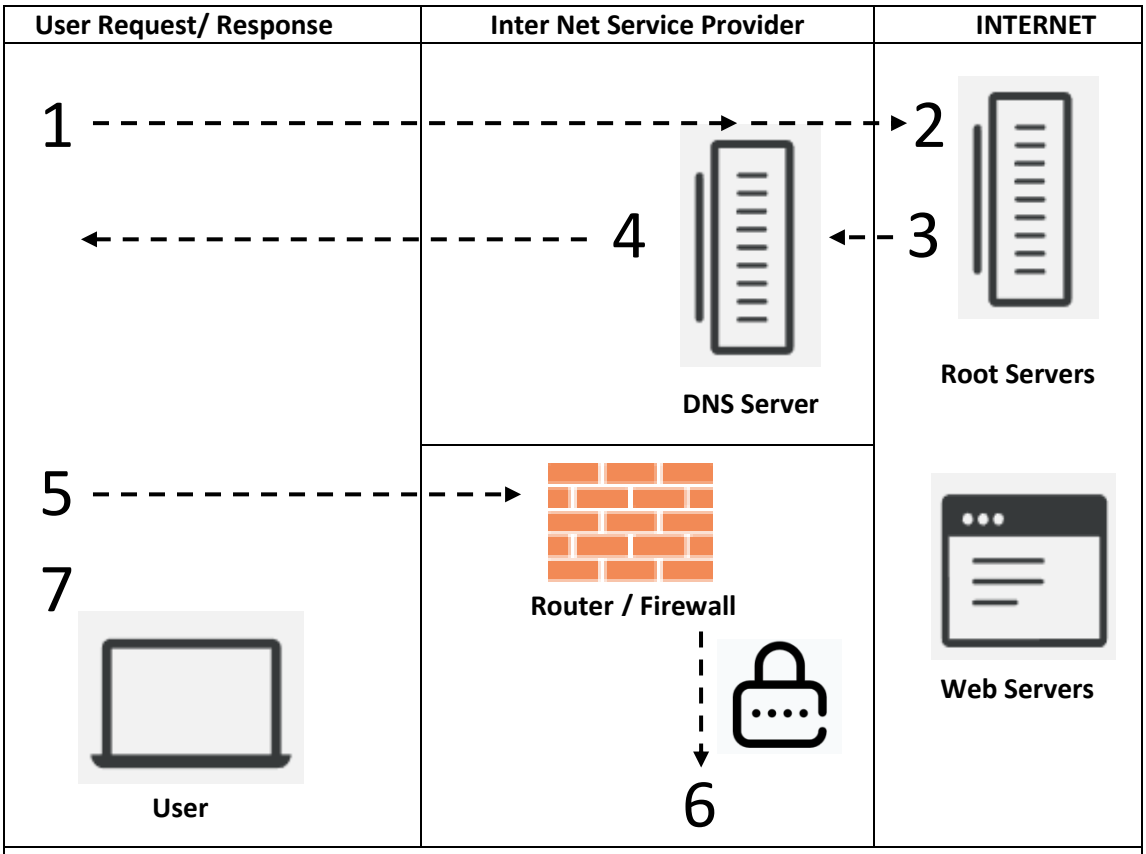
Network Architecture of HTTP Proxy Blocking



1 – User request for www.google.com
2 – Proxy server match the user request with block list data base
3 – If user request matches with the blocked list
4 – Proxy server severs the block page to the user : www.google.com is on the proxy's block list

In the HTTP proxy blocking mechanism, the blocking performed with the help of an associated database of blocked websites with a proxy server. The proxy server observes the user request and matches the pattern with a blacklist, and if the user request matched with the blacklist, the proxy server drops the user request. Only legitimate user requests as per pre-configured database entries forwarded for web page access. The highly configured proxy server also uses the IPTABLES rules for decision making to drop/forward the user request.

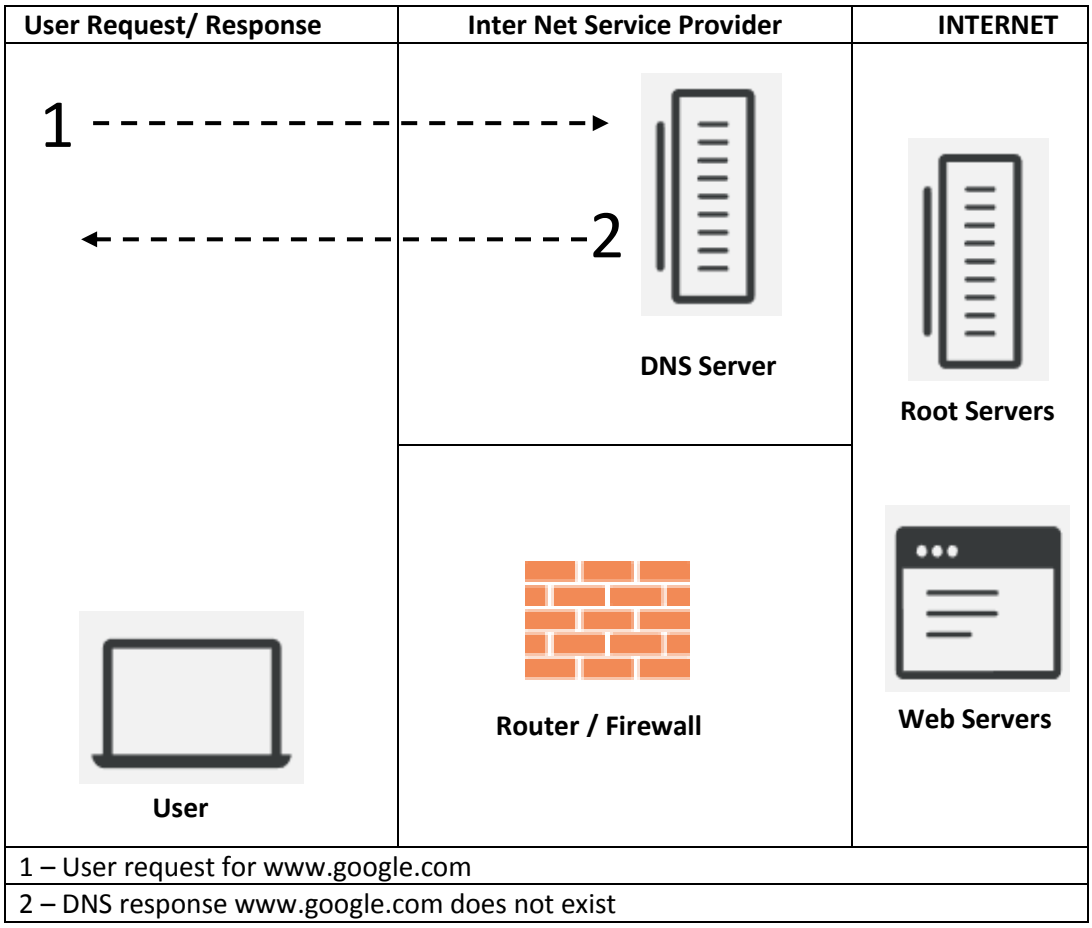
Network Architecture of IP Blocking Techniques



1 – User request for www.google.com
2 – DNS lookup for www.google.com
3 – Lookup response www.google.com is 192.168.1.1
4 – www.google.com is 192.168.1.1
5 – Request forwarded to the web server at 192.168.1.1 to get the web page of www.google.com
6 – Router/ Firewall drops all the packets destine to 192.168.1.1
7 – Web page of www.google.com not serve to user

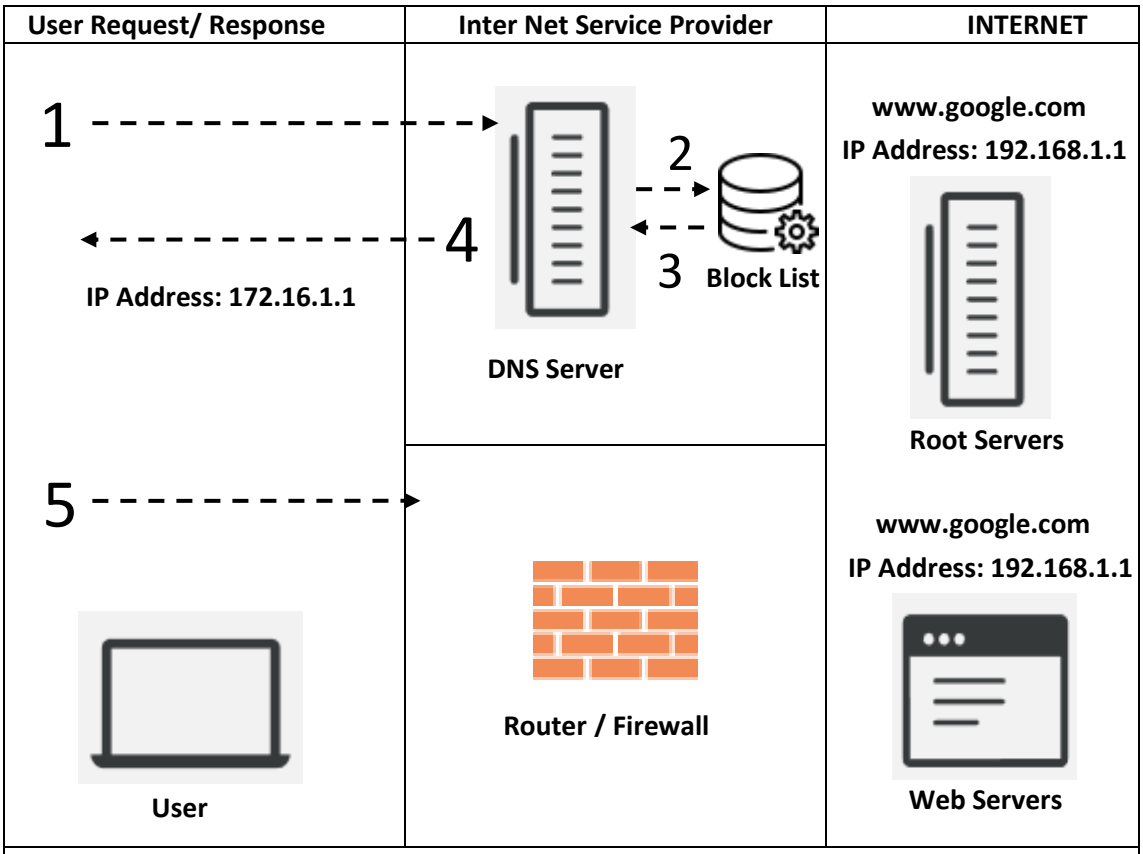
IP Blocking techniques applied at the router level. First, the user request forwarded to the DNS server for the lookup records of the web server IP address. Once the user browser gets the IP address of the webserver, the user request forwarded to the webserver. The router checks the user request with pre-configured blacklist IP addresses and drops the user requests if matched the destination IP address with blacklist IP.

Network Architecture of DNS Poisoning Techniques



In DNS Poisoning techniques, user request forwarded to the DNS server and pre-configured DNS server matches the user request with the blacklist entries, and if matched, no any response forwarded to the user.

Network Architecture of DNS Spoofing Techniques



1 – User request for www.google.com : what is the IP for www.google.com
2 – DNS server match the user request with block list database entries
3 – If user request matched with the blocked list database entries
4 – ISP's intercept actual DNS record for block list and inject the incorrect IP response : 172.16.1.1 to user
5 – Intercepted IP address serve the block page or connection reset or any other thing as per applied policy

In this technique, user website requests forwarded to the DNS server for lookup results of web server IP address and pre-configured DNS server match the user request with the blacklist entries, and if matched, ISPs intercepts actual DNS record response and inject the incorrect IP response to the user. An intercepted IP address serves the block page to the user.

CHAPTER-5

ANALYSES, RESULTS AND DISCUSSION

The present chapter deals with analysis results and interpretations based upon different objectives of the current research. The sections are divided objective wise.

5.1 Objective No.1

To assess the existing policies in India to control unsolicited content.

5.1.1 Analysis and Result

To assess the existing policy in India to control unsolicited content, the researcher filed a Right to Information (RTI) in the Ministry of Electronics and Information technology, Government of India, New Delhi, forgetting the exhaustive information. Researcher pleaded following points in RTI:

I. Kindly provide me a copy of the existing policy to control unsolicited content (Obscenity, pornographic content) or web content filtration.
II. Kindly provide me a copy of the regulation/program/ or any other activity of the government of India in the said area.
III. Kindly provide me the detail in regard of mechanism/ roadmap / network architecture/ network framework to control unsolicited content.

The researcher received an immediate response from the Ministry of Electronics and Information technology, Government of India, New Delhi (Cyber Law and Cyber Security Group) which is as follows –

"With reference to your RTI application related to information in the area of web content filtration of unsolicited content, it is hereby informed that section 67, section 67A and section 67B of Information Technology Act has provisions of punishment for publishing or transmitting obscene material in electronic form, punishment for publishing or transmitting material containing sexually explicit act, etc. in electronic form and punishment for publishing or transmitting material depicting children in sexually explicit act, etc. in electronic form respectively. However, you may please refer to information

technology act 2000 and its amendments available at http://meity.gov.in/content/cyber-laws and https://indiacode.nic.in/handle/123456789/1999?view_type=browse"

If the response is analyzed and read between the lines, it becomes clear that there are some provisions to curb the publishing or transmitting material containing the sexually explicit act, etc. electronic form and punishment for publishing or transmitting material depicting children in a sexually explicit act in electronic form respectively. The response sought from the Ministry of Electronics and Information technology, Government of India, New Delhi (Cyber Law and Cyber Security Group) also refer to *information technology act 2000 and its amendments and section 67, section 67A and section 67B of Information Technology Act.* If we analyze and quote the Information Technology Act, 2000, we find it as follows:

5.1.1.1 The Information Technology ACT, 2000

67. Punishment for publishing or transmitting obscene material in electronic form. – Whoever publishes or transmits or causes to be published or transmitted in the electronic form, any material which is lascivious or appeals to the prurient interest or if its effect is such as to tend to deprave and corrupt persons who are likely, having regard to all relevant circumstances, to read, see or hear the matter contained or embodied in it, shall be punished on first conviction with imprisonment of either description for a term which may extend to three years and with fine which may extend to five lakh rupees and in the event of second or subsequent conviction with imprisonment of either description for a term which may extend to five years and also with fine which may extend to ten lakh rupees.

67A. Punishment for publishing or transmitting of material containing the sexually explicit act, etc., in electronic form. – Whoever publishes or transmits or causes to be published or transmitted in the electronic form any material which contains sexually explicit act or conduct shall be punished on first conviction with imprisonment of either description for a term which may extend to five years and with fine which may extend to ten lakh rupees and in the event of second or subsequent conviction with imprisonment of either description for a term which may extend to seven years and also with fine which may extend to ten lakh rupees.

67B. Punishment for publishing or transmitting of material depicting children in sexually explicit act, etc., in electronic form. – Whoever – (a) publishes or transmits or causes to be published or transmitted material in any electronic form which depicts children engaged in sexually explicit act or conduct; or (b) creates text or digital

images, collects, seeks, browses, downloads, advertises, promotes, exchanges or distributes material in any electronic form depicting children in obscene or indecent or sexually explicit manner; or (c) cultivates, entices or induces children to online relationship with one or more children for and on sexually explicit act or in a manner that may offend a reasonable adult on the computer resource; or (d) facilitates abusing children online, or (e) records in any electronic form own abuse or that of others pertaining to sexually explicit act with children, shall be punished on first conviction with imprisonment of either description for a term which may extend to five years and with fine which may extend to ten lakh rupees and in the event of second or subsequent conviction with imprisonment of either description for a term which may extend to seven years and also with fine which may extend to ten lakh rupees.

Provided that provisions of section 67, section 67A and this section does not extend to any book, pamphlet, paper, writing, drawing, painting representation or figure in electronic form –

i. the publication of which is proved to be justified as being for the public good on the ground that such book, pamphlet, paper, writing, drawing, painting representation or figure is the interest of science, literature, art or learning or other objects of general concern; or
ii. which is kept or used for bonafide heritage or religious purposes. Explanation– for the purposes of this section, "children" means a person who has not completed the age of 18 years.

5.1.1.2 The Information Technology ACT, 2008

Ministry of Law, Justice and Company Affairs (Legislative Department) New Delhi, the 9th June 2000/Jyaistha 19, 1922 (Saka) The following Act of Parliament received the assent of the President on the 9th June 2000 and is hereby published for general information: As Amended by Information Technology Amendment Bill 2006 passed in Lok Sabha on Dec 22nd and in Rajya Sabha on Dec 23rd of 2008**.**

67 Punishment for publishing or transmitting obscene material in electronic form (Amended vide ITAA 2008) - Whoever publishes or transmits or causes to be published in the electronic form, any material which is lascivious or appeals to the prurient interest or if its effect is such as to tend to deprave and corrupt persons who are likely, having regard to all relevant circumstances, to read, see or hear the matter contained or embodied in it, shall be

punished on first conviction with imprisonment of either description for a term which may extend to two three years and with fine which may extend to five lakh rupees and in the event of a second or subsequent conviction with imprisonment of either description for a term which may extend to five years and also with fine which may extend to ten lakh rupees.

67 A Punishment for publishing or transmitting of material containing sexually explicit act, etc. in electronic form (Inserted vide ITAA 2008) - Whoever publishes or transmits or causes to be published or transmitted in the electronic form any material which contains sexually explicit act or conduct shall be punished on first conviction with imprisonment of either description for a term which may extend to **five years** and with fine which may extend to ten lakh rupees and in the event of second or subsequent conviction with imprisonment of either description for a term which may extend to **seven years** and also with fine which may extend to ten lakh rupees.

Exception: This section and section 67 does not extend to any book, pamphlet, paper, writing, drawing, painting, representation or figure in electronic form –

(i) the publication of which is proved to be justified as being for the public good on the ground that such book, pamphlet, paper, writing, drawing, painting, representation or figure is in the interest of science, literature, art, or learning or other objects of general concern; or

(ii) which is kept or used bona fide for religious purposes.

67 B Punishments for publishing or transmitting of material depicting children in sexually explicit act, etc. in electronic form. – Whoever - (a) publishes or transmits or causes to be published or transmitted material in any electronic form which depicts children engaged in sexually explicit act or conduct; or (b) creates text or digital images, collects, seeks, browses, downloads, advertises, promotes, exchanges or distributes material in any electronic form depicting children in obscene or indecent or sexually explicit manner; or (c) cultivates, entices or induces children to online relationship with one or more children for and on sexually explicit act or in a manner that may offend a reasonable adult on the computer resource; or (d) facilitates abusing children online; or (e) records in any electronic form own abuse or that of others pertaining to sexually explicit act with children, shall be punished on first conviction with imprisonment of either description for a term which may extend to five years and with a fine which may extend to ten lakh rupees and in the event of second or

subsequent conviction with imprisonment of either description for a term which may extend to seven years and also with fine which may extend to ten lakh rupees.

Provided that the provisions of section 67, section 67A and this section does not extend to any book, pamphlet, paper, writing, drawing, painting, representation or figure in electronic form –

(i) The publication of which is proved to be justified as being for the public good on the ground that such book, pamphlet, paper writing, drawing, painting, representation or figure is in the interest of science, literature, art or learning or other objects of general concern; or

(ii) which is kept or used for bonafide heritage or religious purposes **Explanation:** For this section, "children" means a person who has not completed the age of 18 years.

5.1.2 Discussion

The law mentioned above and provisions make it clear that there are some provisions of prohibiting transmitting and publishing obscene content or pornographic content, but there is no provision of filtering or blocking the content. Kamlesh Vaswani, an advocate of Indore, Madhya Pradesh high court, filed Public litigation (PIL) Writ Petition No. 177 of 2013 – Kamlesh Vaswani versus Union of India and others (Public Interest Litigation) comprising the following significant points:

(I) PIL for the 'innocent, susceptible, vulnerable': Vaswani says in his PIL that he is fighting for the fundamental rights of 75 percent Indians who are the 'innocent, susceptible, vulnerable women and children of India'.

(II) Porn is 'moral cancer': He claims that pornography "is like moral cancer that is eating our entire society at every second across the country". He has described it as "a trade more deadly than potassium cyanide".

(III) The 'worst killer': According to Vaswani, porn is a "plague" that is "worse than any we could imagine," which hampers people's peace of mind, health and wellness, and puts their happiness and human potential at risk. "Most people know someone affected by this plague, the worst killer that has ever been devised," he writes in his PIL.

IV. 'Worse than AIDS or Hitler': Porn is a slow killer, he says. "Nothing can more efficiently destroy a person, fizzle their mind, evaporate their future, eliminate their potential or destroy society like pornography," says the petition. "It is so terrible that many do not even recognize it until it is too late, and most refuse to admit it. It is worse than Hitler, worse than AIDS, cancer, or any other epidemic. It is more catastrophic than the nuclear holocaust, and it must be stopped".

V. Real sex doesn't 'measure up': Vaswani contends that people who watch porn struggle to emulate it in their actual sex lives — only to fail."Girls and boys who see pornography feel as if they can never measure up and often struggle to perform like the porn stars they have seen online," he says in the petition.

VI. Annoying pop-up ads: He argues that a big reason for his overwhelming concern against pornography is the "display of advertisement of pornographic websites without the permission of the viewer". Interestingly, his contention is that these could prove embarrassing in certain gatherings. "Such uncontrolled display of porn advertisement banners usually come out while, browsing the internet at home or business meetings and are sufficient to offend the people browsing the internet".

VII. Not an attack on freedom of expression: According to Vaswani, making porn illegal and enforcing a total ban "is not a very serious attack on the freedom of speech and expression." He argues that since porn is "neither speech nor expression," but "purely a conduct," it is an anti-societal pursuit.

VIII: 'Mental images can never be erased': While hearing the writ petition L. Nageswara Rao, Additional Solicitor General, submitted that the Cyber Regulation Advisory Committee had been constituted under Section 88 of the Information Technology Act, 2000, and one of the briefs assigned to that Committee is with regard to the availability of Pornography on the Internet. The meeting of the Cyber Regulations Advisory Committee meeting held on the 05th of September 2014 in DeitY. The meeting minute of the same is as follows.

Minutes of the Cyber Regulation Advisory Committee meeting held on 5th September 2014 in DeitY

1. The meeting of the Cyber Regulation Advisory Committee was held on 5th September, 2014 in the Conference Room No. 1007 at DeitY under the

Chairmanship of Shri Ravi Shankar Prasad, Hon'ble Minister of Communications and IT. The other members who attended the meeting are:

i. Shri Anil Goswami, Secretary, Ministry of Home Affairs
ii. Shri P.K. Malhotra, Secretary, Department of Legal Affairs
iii. Shri R.S. Sharma, Secretary, Department of Electronics and IT
iv. Shri Rakesh Garg, Secretary, Department of Telecommunications
v. Dr. Sanjay Singh, Secretary, Legislature Department
vi. Shri Ravikant, Addl. Secretary, Ministry of Defence
vii. Shri Sudhanshu Pandey, Jt. Secretary, Department of Commerce
viii. Shri O.P. Galhotra, Joint Director, Central Bureau of Investigation
ix. Shri Niket Kaushik, IG ATS, Maharashtra
x. Dr. Kamlesh Bajaj, CEO, DSCI, NASSCOM
xi. Shri Rajesh Chharia, President, Internet Service Providers Association of IndiaShri Ajay Sharma, Sr. Director, ASSOCHAM
xii. Shri Babulal Jain, ASSOCHAM
xiii. Shri Sujit Haridas, DDG, Confederation of Indian Industry
xiv. Shri Akanksha Kumar, Confederation of Indian Industry
xv. Shri Vijay Madan, Chairman, Cyber Security Committee, FICCI
xvi. Ms. Sarika Gulyani, Head – IT & Telecom Divn., FICCI
xvii. Shri R.K. Vyas, Computer Society of India
xviii. Dr. Subho Ray, President, Internet and Mobile Association of India (IAMAI)
xix. Dr. Gulshan Rai, DG, CERT-In, DeitY. (Member Secretary)
xx. Shri A.S.A. Krishnan, Sr. Director, DeitY.
xxi. Shri. Gaurav Gupta, JD, DeitY

2. Hon'ble Minister extended a warm welcome to the members. After the introduction of the members, DG (CERT-In) briefly presented the background for convening the Cyber Regulation Advisory Committee meeting. It was informed that a writ petition has been filed by Shri Kamlesh Vasvani in Supreme Court. The objective of the writ petition is to block pornography websites and related content. The petitioner has submitted that easy access to porn websites results in illegal activities like rape, harassment, molestations of women. The respondents in the writ petition are DeitY, DoT, Ministry of I&B, Home Affairs, and Internet Service Provider Association of

India. DeitY, DoT, and Internet Service Provider Association of India have filed their counter-affidavits. The case was listed the number of times before different benches in the Supreme Court. The last hearing was on 29th August 2014 before the bench headed by Hon'ble Chief Justice of India. The Additional Solicitor General suggested that the issue of availability of Pornography material and the filtering of the same is a social matter and cuts across all the sections of society. The Supreme Court was also apprised of the technical issues and challenges involved in blocking pornographic content and websites. The Supreme Court in its Order directed that it would be appropriate, if the Government places the copy of the writ petition and interlocutory applications before the Cyber Regulation Advisory Committee, which has members from all sections of the Society including Government, Industry, Civil Society and Academy, for its consideration. DG (CERT-In), further, mentioned that there are approximately 40 million pornography sites on the Internet, and these sites keep changing the name and IP address to avoid blocking. He also brought out the existing provisions in the Information Technology Act 2000 and Indian Penal Code to deal with pornography as well as the provision of IT Act through which objectionable sites are blocked as and when reported by various agencies. He also presented the mechanism through which countries like UK and European Countries & USA propose to address the challenge. The UK and Australian Governments are working with NGOs to spread education and awareness to control the menace of pornography. Further, the UK Government freely distributes filtering software, which can be installed at homes by parents to make Internet browsing safer for the children. It was also pointed out that these countries are largely focusing on child pornography as it is classified as a crime, while pornography is not a crime in many of the countries. Countries like Saudi Arabia and some Middle East Countries have installed filters at Telecom / ISP level, which has been reported to be not adequately effective. He also informed that we intimated Shri. Kamlesh Vaswani through letters & phone calls. He, however, could not be present in the meeting. The petition was placed before the Advisory Committee. A copy of the presentation made by DG, CERT-In in the meeting is at Annexure. Regarding

the second agenda point for the meeting, Dr. Gulshan Rai informed that Shri Sharad Pawar, Hon'ble Member of Parliament and Leader of the NCP Party, in his letter to the Prime Minister has raised the recent incidents of communal and related violence in Maharastra triggered by objectionable profiles posted on the social networking sites, hurting sentiments of certain sections of society.

3. Secretary, Deity explained that proxy servers are used to bypass filters deployed by ISPs. He added that "https" websites with encrypted content are also used to transmit pornographic material, which makes filtering difficult as the data is encrypted. He added that Deity takes prompt action under Section 69A of IT 2000 for blocking of web sites with objectionable contents whenever requests are received from law enforcement agencies. With regard to pornography sites, he suggested that to start with the list of child pornography sites for blocking may be obtained from sources of other countries, where such sites are banned strictly.
4. Secretary, Ministry of Legal Affairs, brought out that pornography is a social problem, and apart from legal provisions to tackle the issue, cooperation is required from all sections, including the public, for restricting the availability. Further, he mentioned that the legality of viewing pornography content in private needs to be examined, though hosting and transmission such content is punishable. He also expressed that it is not desirable to submit the plea to the Supreme Court that it is difficult to filter/block pornography sites, and we must try to evolve a solution.
5. Secretary, DoT informed that orders for blocking are implemented through ISPs immediately when orders are received for blocking. However, when a large number of pornography sites are to be blocked, the latency for Internet access would increase, which would slow down the Internet. The infrastructure at ISPs end needs to be upgraded to deal with such a large number of web sites for blocking. He expressed that incremental efforts in phases can be considered for implementation for filtering at gateways by upgrading the infrastructure at Internet gateways and distributing filtering software for installation at homes/offices.
6. Secretary, MHA mentioned that MHA and CERT-In are working together to block websites containing objectionable contents having the potential to

create communal violence and law and order problem as well as sensitive from the national security point of view. He further added that the Ministry of I&B has set up the National Media Centre to monitor the contents of various websites on the Internet on a 24 x 7 basis.

7. Shri. O.P Galhotra, from CBI, felt that help from Interpol might be sought with reference to illegal sites hosted outside the country. He also mentioned that there is a need for awareness creation among agencies with regard to blocking provisions and procedures to be followed when such sites need to be blocked. Further, after blocking, the Ministry of Home affairs may need to be approached for possible prosecution, he added.
8. Shri Rajesh Chharia of ISPAI mentioned that the websites are located outside India; in the US, UK and Australia adult pornography are legal, and only child pornography is banned in these countries. China deploys firewalls at the ISPs' Internet gateways to filter and block objectionable contents. However, proxy servers are used to bypass such filters. In addition, most of the sites, including payment based sites, employ "https" based encryption, due to which ISPs are not in a position to block such sites. Blocking at the source is one of the effective solutions to control the viewing of pornography. However, pornography sites are located in countries where such content is legally allowed, due to which blocking may not be possible at the source. It was also brought out that sites containing pornography content enable spreading Malware. Since payment is involved in viewing some of the sites, financial crimes are committed by students for accessing pornography on the Internet. It was suggested that the repository of blacklisted pornography sites by autonomous bodies / NGOs might be required to be built for blocking such sites, and media campaigns would also help in containing the menace. He informed that ISPAI is already conducting education & awareness programs in schools and colleges to sensitize the matter.
9. Shri Subho Ray of IAMAI stated that filtering of pornographic content at the level of cable landing stations before such content reaches ISPs may be explored. However, it was clarified that identifying the content for filtering at the IP packet level is difficult to implement at the cable landing stations. It was suggested that a mechanism with hotlines for reporting

objectionable sites may need to be created. Also, complaints may be registered to police regarding such sites.

10. Dr. Bajaj, representing NASSCOM, brought out that since servers with objectionable contents are located outside the country, the MLAT mechanism needs to be employed, which is time-consuming and may not to be successful always. Unintended consequences of filtering of legitimate traffic need to be taken into account when blocking is carried out. However, the Chairman stressed that the larger issue of respecting cultural values of the country and sentiments of the Indian society needs to be considered, and all possible ways and means may have to be devised in this context.
11. Shri Sujit Haridas of CII indicated the importance of maintaining the repository of blacklisted pornography sites by autonomous bodies / NGOs. It was also brought out that simultaneously creating awareness among home users/citizens encouraging them to install filters to block porn content on individual machines may be an effective step towards controlling objectionable content.
12. Shri. Vijay Madan, from FICCI, also reiterated that education and awareness among the public regarding ill effects of viewing pornography available on the Internet should be undertaken by the Government with the help of NGOs. Further, he endorsed the views expressed by others with regard to making available filtering software free of cost by the Government for installation at homes.
13. Dr. Arvind Gupta, who was invited for the meeting, could not attend the meeting due to prior commitments. However, he conveyed that a solution may need to be worked out to prevent the availability of pornography on the Internet, considering the cultural sensitivities of the country.
14. MCIT emphasized that the matter is to be viewed in the context of Indian culture and moral obligation towards society. Capturing the essence of discussions and views expressed by members, he said that NGOs will have to play a lead role and work together with the Government in creating awareness & education for sensitizing ill effects of the subject matter. He requested IAMAI, being an Association of members from content providers, to lead the effort, as social responsibility, to monitor and collect the list of pornography sites from various sources, which can be provided to ISPs to enable blocking.

IAMAI may set up a group to prepare a list of such sites and provide the same to DeitY, who will take further action for their blocking. Govt. will provide the necessary support to IAMAI to carry out the task. IAMAI agreed to take up the task as requested by MCIT. Further, MCIT directed DeitY and DoT to work together to upgrade the blocking infrastructure at ISPs in order to implement blocking effectively. He reiterated that the mechanism followed by the UK for distributing filtering software for installation at home computers through ISPs may also be studied and replicated with necessary modification for the Indian context. Regarding the misuse of social media for disturbing social harmony in the country, MCIT requested MHA to look into the matter and evolve steps to prevent misuse. The meeting ended with thanks to the Chair.

5.2 Objective No.2

To investigate into the existing web content filtration mechanism in India.

5.2.1 Analysis and Result

While studying the policy to regulate unsolicited content on internet the researcher come across an order issued by Ministry of Electronics & Information Technology Cyber Laws & E-Security Division, Government of India dated the 18th of April, 2017 under the subject "measures to Curb Online Child Sexual Abuse Material (CSAM)." This order is as follows: (**No. 1(3)/2016-CLFE - Government of India Ministry of Electronics & Information Technology / Cyber Laws & E-Security Division: Date 18h April 2017) -** Subject: Measures to Curb Online Child Sexual Abuse Material (CSAM) –

> *In exercise of the powers conferred by clause(s) of sub-section* 2 *of section* 87 *read with sub-section* (2) *of section* 79 *of the Information Technology Act, 2000* (21 *of 2000), the Central Government hereby makes the following Order:* WHEREAS the publication or transmission of material depicting children in sexually explicit act or conduct in electronic form is a heinous crime, specifically prohibited by Section 67B of the Information Technology Act, 2000 (21 of 2000).
>
> Containing the spread of online child sexual abuse material (hereinafter called tlCSAMtI) is an important public policy *goal* for India, and the Central Government

intends to take immediate action to contain this menace. The Hon'ble Supreme Court in *Kamlesh Vaswani* v *Union of India* [W.P. (Civil) No. 177 of 2013] has also directed the Union of India to take positive steps to tackle the issue of CSAM, in its order dated 12.7.2013.

In December 2016, the Central Government constituted an Inter-Ministerial Committee ("IMC") vide its Order No. 4(12)/2013-CLFE (Vol.V), to recommend specific solutions to address the issue of online CSAM. The IMC observed that:

(i) Most of such online CSAM is being hosted outside India and the websites URLs to access such unlawful content are dynamic in nature and frequently changing, making it difficult to identify and block such content.

(ii) No centralized mechanism exists in India to monitor online CSAM.

(iii) Globally, there exist *only* a few major resources that provide a dynamic list of Websites/URLs identifying online CSAM.

(iv) The Internet Watch Foundation (hereinafter called the "IWF") maintains such a list of dynamically updated websites/URLs containing online CSAM (hereinafter referred to as "IWF Resources"). IWF has been adopted by many countries and is already being implemented by leading online service providers in other jurisdictions. Further, IWF resources are available to ISPs on a subscription basis, either individually or collectively.

Accordingly, the IMC recommended that, till such time a centralized mechanism is built in India to dynamically monitor websites/ URLs containing online CSAM, the relevant ISP's in India should adopt and disable / remove the online CSAM dynamically based on IWF list.

Currently, all Internet Service Providers ("ISPs") have an obligation to observe certain due diligence requirements and remove or disable access to content which is considered pedophilic or harms minors in any way, as per Section 79(2) (c) read with Section 2(1) (w) of the Information Technology Act, 2000 and sub-rule (2) and (4) of Rule 3 of the Information Technology (Intermediary Guidelines) Rules, 2011.

Therefore, based on the recommendations of the IMC, and in the exercise of the powers conferred on the Central Government under Section 79(2) (c) of the Information Technology Act 2000 to prescribe due diligence requirements to be observed by intermediaries, it is hereby ordered that:

a. ISP's having Cable Landing Station Gateways / International Long Distance licenses in India shall be required to adopt and implement IWF Resources on or before 31st July 2017 to prevent the distribution and transmission of online CSAM into India.
b. All ISP's shall continue to observe the existing due diligence requirements prescribed by the Central Government under the Information Technology Act, 2000, and Rules and Regulations thereunder, including the obligation to expeditiously remove or disable access to any unlawful content brought to its notice by relevant authorities. This order shall take immediate effect.

The committee observed the following four major points.

i. Most of such online CSAM is being hosted outside India and the websites/URLs to access such unlawful content are dynamic in nature and frequently changing, making it difficult to identify and block such content.
ii. No centralized mechanism exists in India to monitor online CSAM
iii. Globally, there exist *only* a few major resources that provide a dynamic list of websites/URLs identifying online CSAM
iv. The Internet Watch Foundation (hereinafter called the "IWF") maintains such a list of dynamically updated websites/URLs containing online CSAM (hereinafter referred to as "IWF Resources"). IWF has been adopted by many countries and is already being implemented by leading online service providers in other jurisdictions. Further, IWF resources are available to ISPs on a subscription basis, either individually or collectively.

Hence, it becomes clear that there is no central mechanism at the government level to regular monitoring and action taken to block the websites in India. The primary way using to block the websites to issue the government orders to ISPs to block the websites on the basis of the provided list. The current state of affairs – On the basis of the governmental blacklist, ISPs implements the blocking activity at their network. In compliance of the Hon'ble Supreme Court direction, The Central Government constituted Inter-Ministerial Committee ("IMC") to analyze the issue in dept and recommendation to address the issue. The IMC recommended that at present no any centralized mechanism exists in India for monitoring and blocking of Child Sexual Abuse Material (CSAM), and due to the unavailability of dynamic update lists in

India, all the ISPs will mandatory use The Internet Watch Foundation IWF dynamic list.

5.3 Objective No. 3

To evaluate existing network architectures of ISPs in India.

5.3.1 Analysis and Result

To assess the existing network architecture of ISPs in India, the researcher compiles a list of potentially blocked 849 websites by the Indian Government. The result shows the limitation of the network level recourses and the poor mechanism used by the ISPs to block the websites. Presently government agencies don't have any centralized mechanism and dynamic update list of websites to address the mandatory issues which are directed by the Hon'ble Supreme Court of India. There is no any clear road map prepared yet now to deal with the issues holistically. ISPs are complying with the government orders, but no agencies deputed to analyze the effectiveness of the blocking that whether it suffices the actual on-ground issues or just complying with the paper formalities. When the researcher prepares the test network to access the blocked websites, the end results were very awaking that more than 95% of the websites successfully browsing. It concluded that the technology being used and the present infrastructure of the ISPs not equipped well to cater to the issues in real sense. If present network architecture of ISPs not in a situation to block the limited websites of 849, so how the ISPs will deal with the millions of websites and content filtering issues of web censorship.

Table - 5.1 : Tor Relay Success %

Error Code	Description	Tor Browser Success %
302	Found	96
301	Moved Permanently	98
200	OK	99

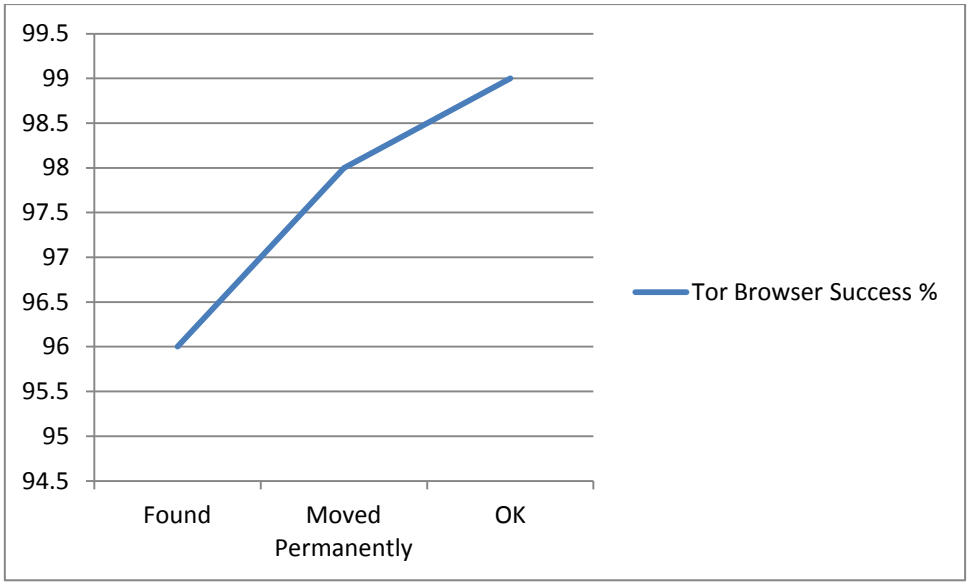


Figure - 5.1 : Tor Relay Success %

Table 5.1 and Figure 5.1 represent that porn websites across the different categories of error codes/ response codes (302, 301, and 200) are browsable with the Tor browser at the success rate of more than 96%.

Table - 5.2 : Opera Browser (VPN) Success %

Error Code	Description	Opera Browser (VPN) Success %
302	Found	97
301	Moved Permanently	96
200	OK	98

Figure - 5.2 : Opera Browser (VPN) Success in percentage

Table 5.2 and Figure 5.2 represent that porn website under the category of error code/ response code (302, 301 and 200) are browsable with Opera browser at the success rate of more than

5.3.2 Mechanism

In order to estimate the status of the blocked websites, the status of all the websites evaluated against banned website by the department of information and technology in respect of the following techniques, namely used by the ISPs.

I. HTTP Filtering
II. DNS Tampering
    (a) DNS Poising
    (b) DNS Injection
III. TCP IP Blocking

I. HTTP Filtering: Using HEAD MasterSEO tools, 849 blocked websites were evaluated. The top four broad categories of the websites based on the further higher number of counts for HTTP error code/ status code responses (200, 301, and 302, blank) were identified. The HTTP status codes indicated whether a specific HTTP request had been successfully completed or not. Every HTTP request that is received at server level is responded with an HTTP status code. HTTP status codes consist of three-digit codes and grouped in different classes. The class of status code identified by its first digit of the status code responses –

1xx: Informational

2xx: Success

Table - 5.3 : Description of Error Code/ Status Code 200		
Error Code / Status Code	Message	Description
200	OK	This code indicates that the server successfully processed the request and, in response, provided the requested page.

3xx: Redirection

Table - 5.4 : Description of Error Code/ Status Code 301, 302		
Error Code / Status Code	Message	Description
301	Moved Permanently	This code refers that the requested page permanently moved to a different location. It means the server forwards the user request to the new associated location.
302	Found / Moved Temporarily	This code refers that the present server is catering to the user request from the different locations, but in the future, the user request may be catered from the previous or original location.

4xx: Client Error

5xx: Server Error

Table - 5.5 : An overview of Technical Status of blocked websites in India based on Error Codes								
Error Code Description	Error Codes							No of URL
Row Labels	200	301	302	307	403	404	(blank)	Grand Total
Forbidden					3			3
Found			43					43
Found: Moved Temporarily			1					1

Found, Redirect Loop			3					3
Invalid Server Response							10	10
Moved Permanently		186						186
Moved Temporarily			6					6
Name Not Resolved							137	137
Not Found						4		4
OK	449							449
Redirect			2					2
Temporary Redirect				4				4
Timeout							1	1
Grand Total	449	186	55	4	3	4	148	849

Table - 5.6 : Top Four Broad Categories of Websites based on Error Codes

	Error Codes				No of URL's
Description: Error Code	200	301	302	0 (blank)	Grand Total
Found			43		43
Moved Permanently		186			186
Name Not Resolved				137	137
OK	449				449
Grand Total	449	186	43	137	815

5.3.3 Sample and Sampling

In this study, 262, porn websites were selected as a sample through a proportionate stratified random sampling method. The sample size determined using the help of formula for the determination of sample size for the known population (Cochran, 1963, p. 75).

The sample size for the population

$$\frac{n_0 = z^2 * P(1-P)}{e^2}$$

Equation 1

Where

n_0 = Initial sample size

z = Selected critical values of desired level of confidence or risk from (Z-table) 90% (1.645), 95% (1.96), 99% (2.576)

P = Estimated proportion of an attribute that is present in the population of maximum variability of the population Maximum Variability (50%) that is (0.5)

e = Desired level of precision or margin of error (+- 5%) that is (0.05)

Now putting the values in formula

$$\frac{n_0 = 1.96^2 * 0.5(1-0.5)}{(0.05)^2}$$

$$= 384.16 = 384$$

Now calculate population correction factor for sample size for known population –

$$n = \frac{n_0 N}{n_0 + (N-1)}$$

(Equation 2)

Where

n = Sample size for known population

n_0 = Initial sample size for population (which is 384)

N = Known population (which is 815)

$$n = \frac{384 * 815}{384 + 814}$$

$$= \frac{312960}{1198}$$

$$= 261.23 = 261$$

Sample size of the strata = $\frac{Size\ of\ entire\ sample}{population\ size\ *\ layer\ size}$ (Equation 3)

Now putting the values in the formula

Table - 5.7 : Sample Description Based on Error Codes

Strata	Known Population	Calculations	Sample
200	449	$\frac{261}{815 * 449} = 143.79 = 144$	144
301	186	$\frac{261}{815 * 186} = 59.56 = 60$	60
0	137	$\frac{261}{815 * 137} = 43.87 = 44$	44
302	43	$\frac{261}{815 * 43} = 13.77 = 14$	14
			262

5.3.4 Experimental Results: Analysis and Discussion

When an attempt was made to access the blocked website / URL's to use of the tools (tor browser and opera browser with virtual private network (VPN) facility) which uses the different ports and protocol of the Open System Interconnection (OSI) model for the communication to serve the user request. The results were very awaking that more than 95% of the website in each strata were successfully browsed with these tools and technology except the HTTP 0/Blank error codes/ status codes (Name Not Resolved) websites. Name Not Resolved means that the hostname/ website you are trying to connect cannot be resolved to an IP address (Hostname/ website name resolved to IP addresses by a Domain Name Server system).

Table - 5.8 : Tor Relay Success %		
Error Code	Description	Tor Browser Success %
302	Found	96
301	Moved Permanently	98
200	OK	99

Figure - 5.3 : Tor Relay Success %

Table 5.8 and Figure 5.3 represent that porn websites across the different categories of error codes/ response codes (302, 301, and 200) are browsable with the Tor browser at the success rate of more than 96%.

Table - 5.9 : Opera Browser (VPN) Success %		
Error Code	Description	Opera Browser (VPN) Success %
302	Found	97
301	Moved Permanently	96
200	OK	98

Figure - 5.4 : Opera Browser (VPN) Success in percentage

Table 5.9 and Figure 5.4 represent that porn website under the category of error code / response code 302, 301, and 200 are browsable with the Opera browser at the success rate of more than 96%.

Table - 5.10 : Comparison of Tor Relay & Opera Browser (VPN) Success %

Error Code	Description	Tor Browser Success %	Opera Browser (VPN) Success %
302	Found	96	97
301	Moved Permanently	98	96
200	OK	99	98

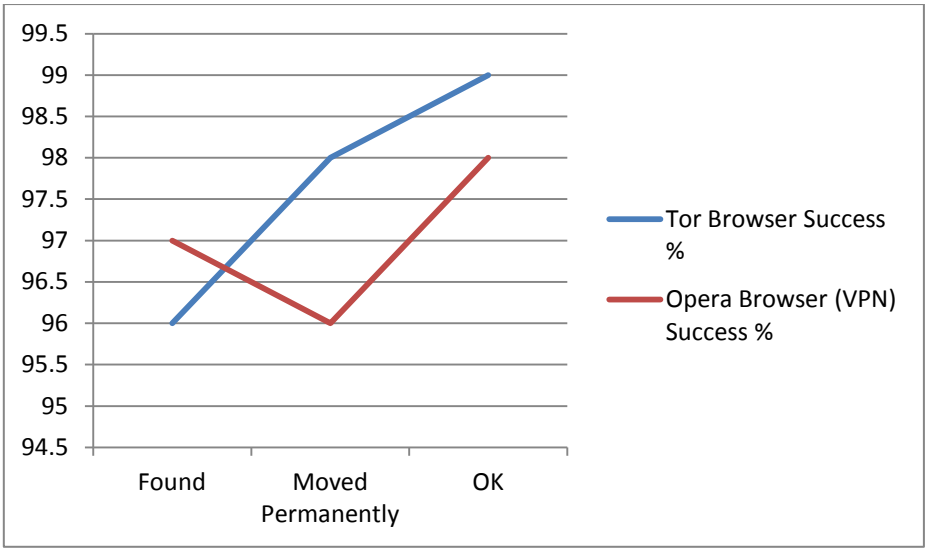


Figure- 5.5 : Comparison of Tor Relay & Opera Browser (VPN) Success in percentage

Table 5.10 and Figure 5.5 indicate that more than 95% of the websites were selected as the sample is easily accessible with the help of these browsers.

Table - 5.11 : Status of Websites with Blank Error Codes	
Status of websites with blank error codes	No. of Domains
Domain Name Available for Purchase	24
A Records Not Found	21
Total No of Websites	45

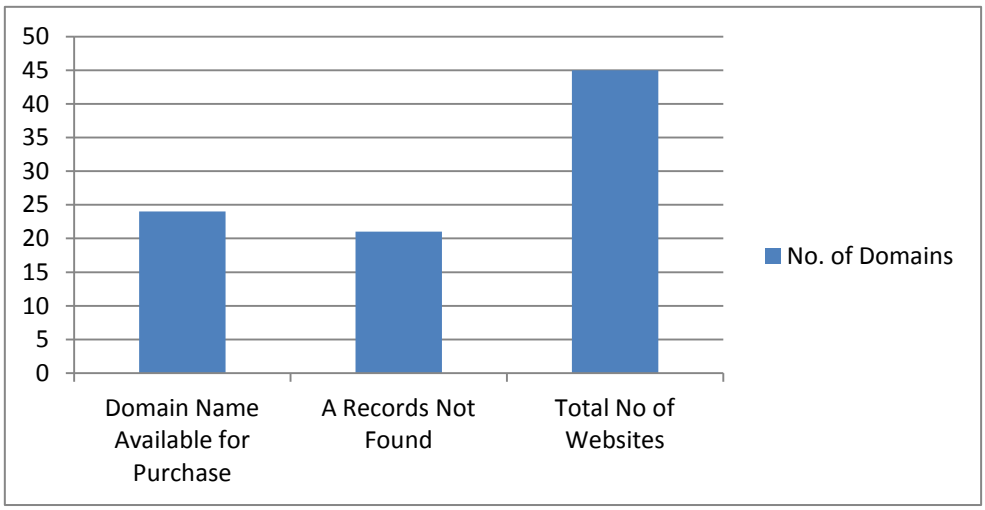


Figure - 5.6 : Status of Website with Blank Error Codes

Table 5.11 and Figure 5.6 show the status of the domain name of the websites for the bank error codes. Out of 45 websites in this category, 24 domain names available for purchase for this testing, were used the GoDaddy bulk domain check web utility Register Domains in bulk at GoDaddy. 21 domain names of websites existed but not mapped with any A records for this testing we have used the infobyip.com web utility page ipbulklookup.php (InfoByIP.com.).

5.3.5 Wireshark - Testing Results

Figure - 5.7 : Browser: Web Site Access Request

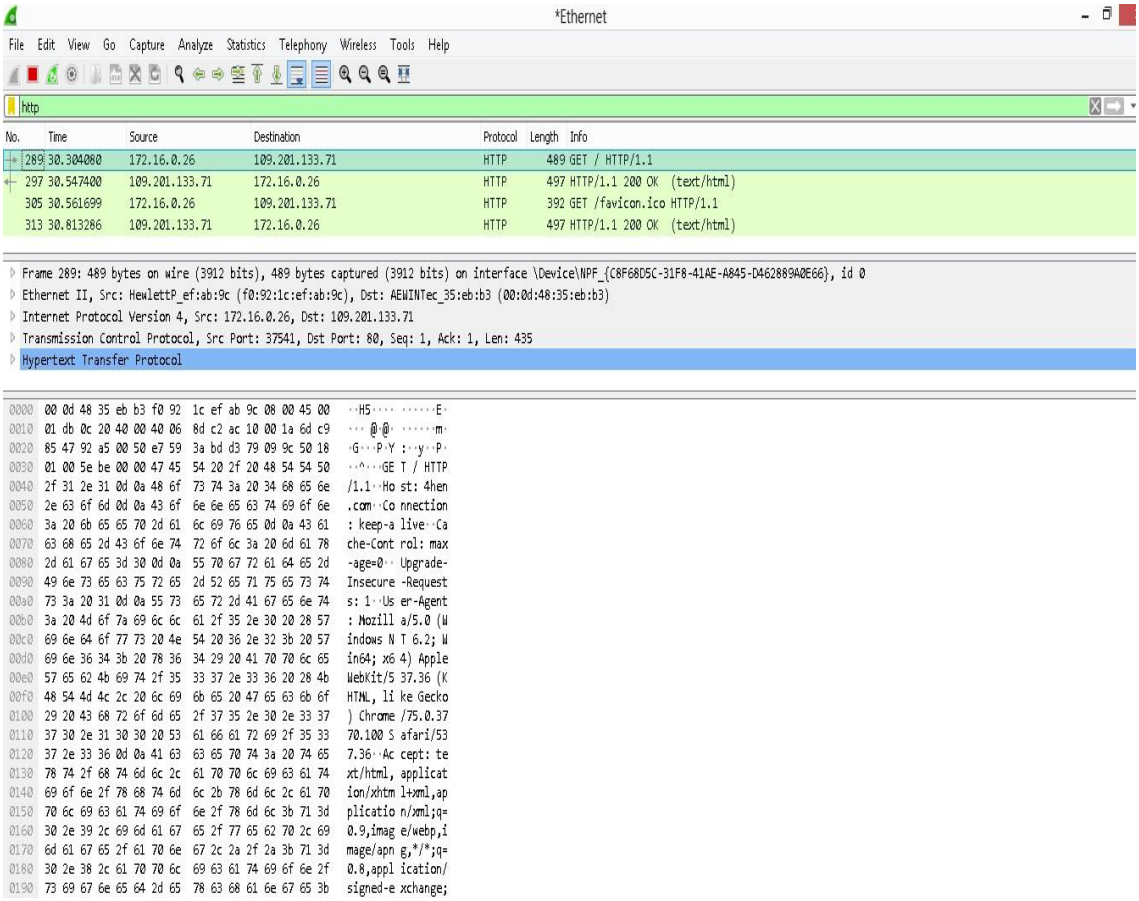


Figure - 5.8 : Wireshark: Success: HTTP Response

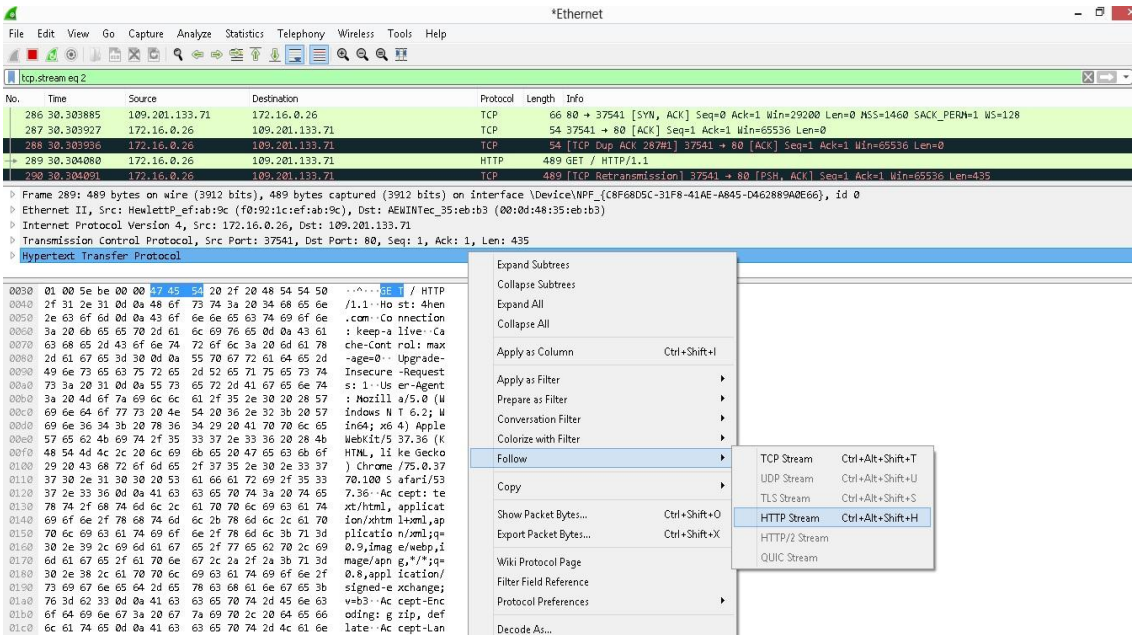


Figure - 5.9 : Wireshark: Success Handshake: HTTP Stream Request

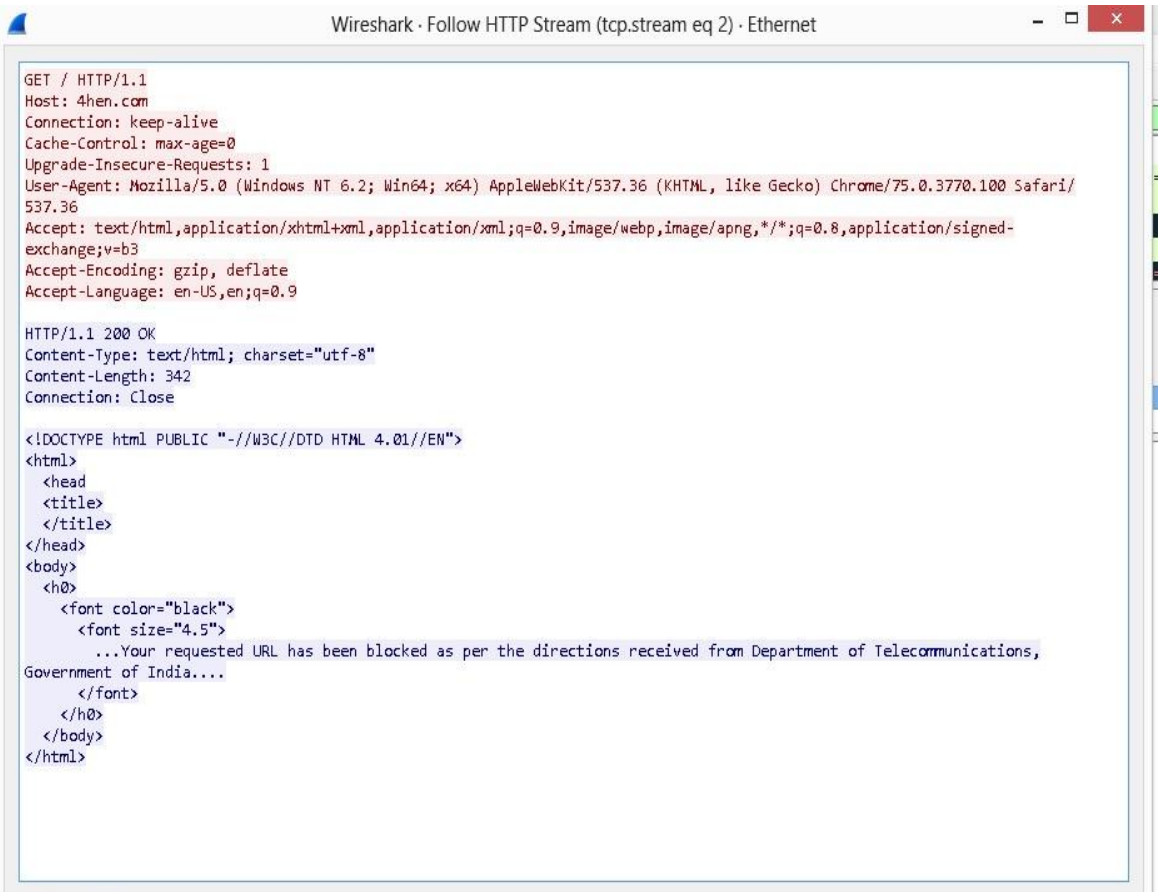


Figure - 5.10 : Wireshark: Success Response: HTTP Stream

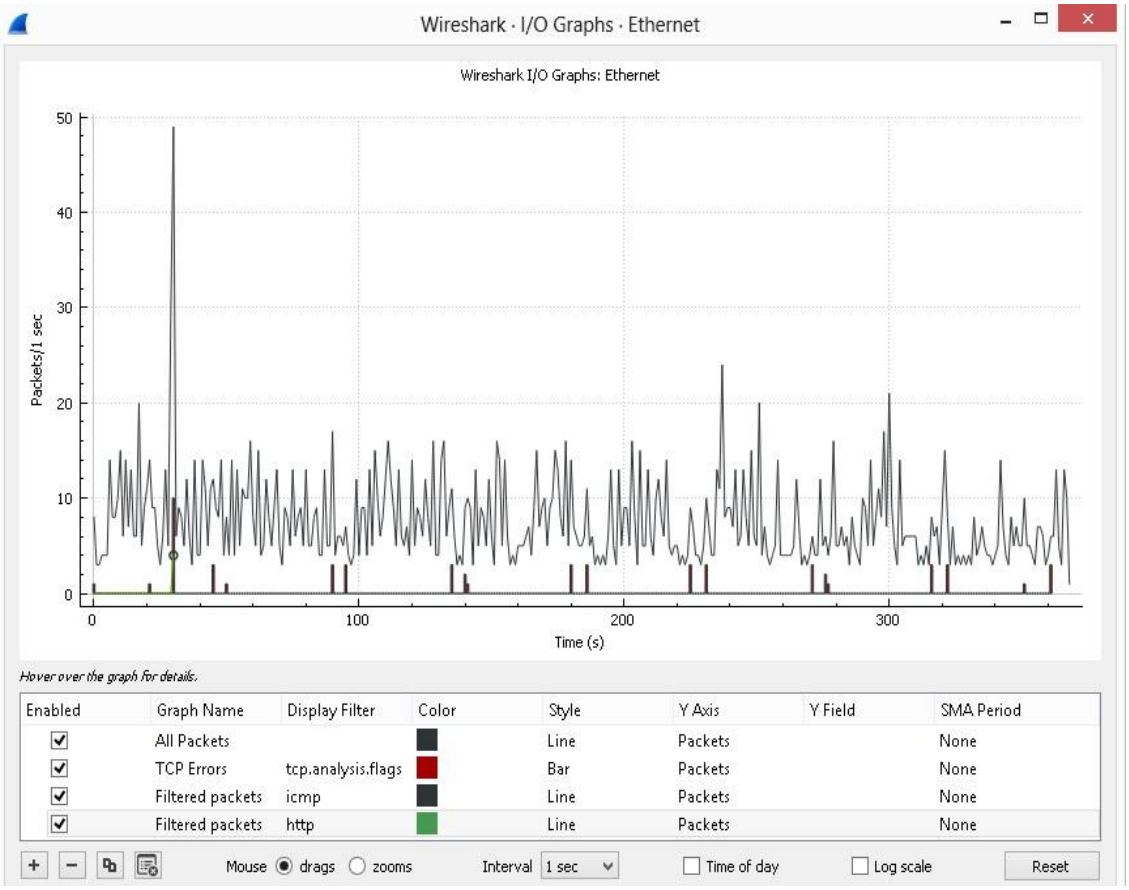


Figure - 5.11 : Wireshark: I/O Graphs - Ethernet

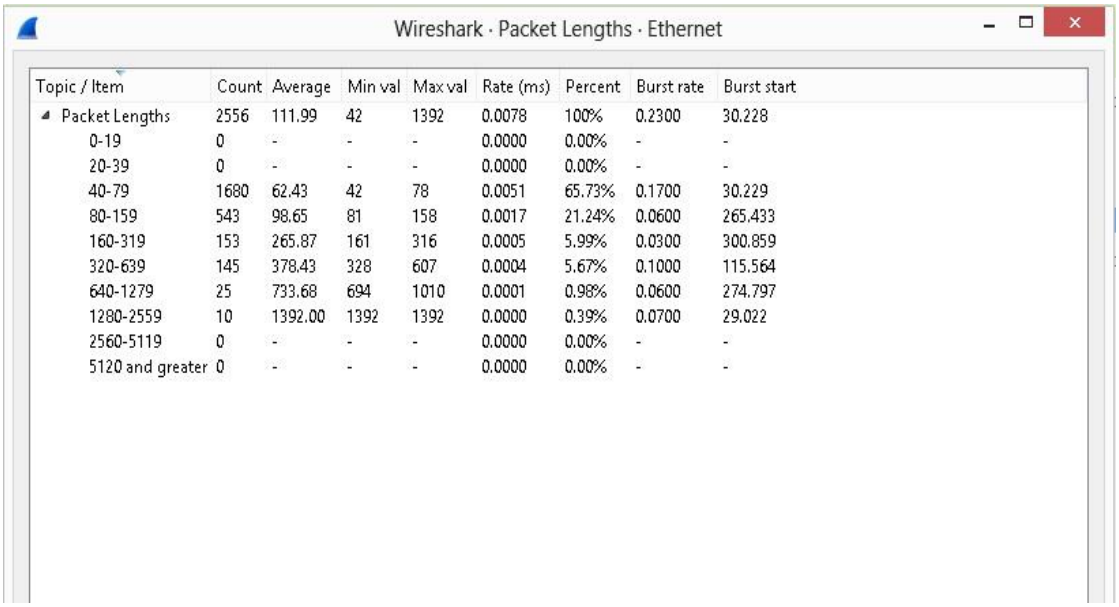
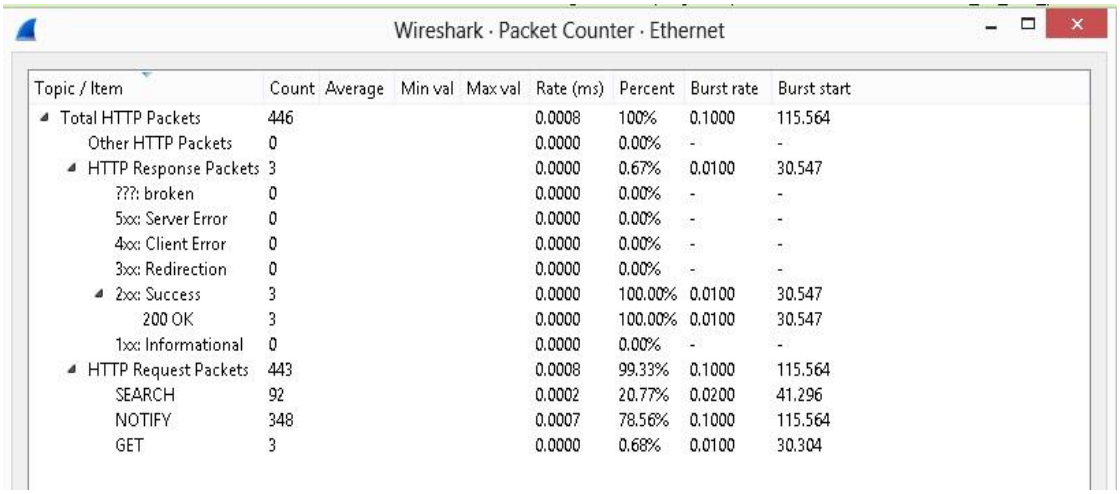


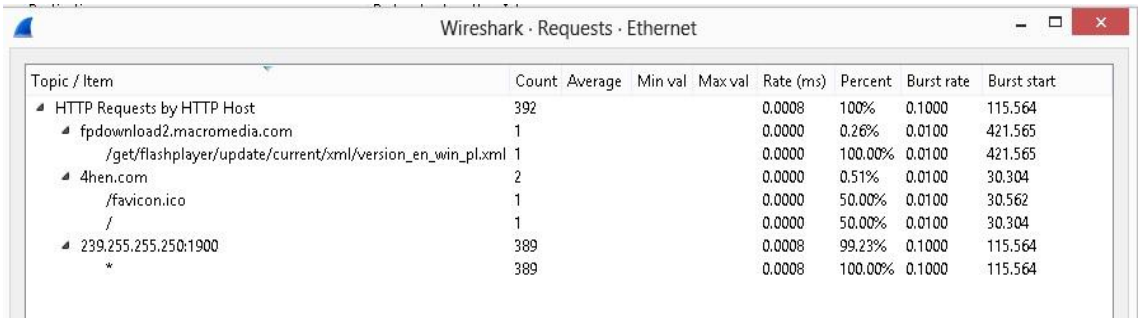
Figure - 5.12 : Wireshark: Packet Lengths - Ethernet

Figure - 5.13 : Wireshark: Flow - Ethernet



Topic / Item	Count	Average	Min val	Max val	Rate (ms)	Percent	Burst rate	Burst start
Total HTTP Packets	446				0.0008	100%	0.1000	115.564
Other HTTP Packets	0				0.0000	0.00%	-	-
HTTP Response Packets	3				0.0000	0.67%	0.0100	30.547
???: broken	0				0.0000	0.00%	-	-
5xx: Server Error	0				0.0000	0.00%	-	-
4xx: Client Error	0				0.0000	0.00%	-	-
3xx: Redirection	0				0.0000	0.00%	-	-
2xx: Success	3				0.0000	100.00%	0.0100	30.547
200 OK	3				0.0000	100.00%	0.0100	30.547
1xx: Informational	0				0.0000	0.00%	-	-
HTTP Request Packets	443				0.0008	99.33%	0.1000	115.564
SEARCH	92				0.0002	20.77%	0.0200	41.296
NOTIFY	348				0.0007	78.56%	0.1000	115.564
GET	3				0.0000	0.68%	0.0100	30.304

Figure 5.14 - Wireshark: Packet Counter - Ethernet



Topic / Item	Count	Average	Min val	Max val	Rate (ms)	Percent	Burst rate	Burst start
HTTP Requests by HTTP Host	392				0.0008	100%	0.1000	115.564
fpdownload2.macromedia.com	1				0.0000	0.26%	0.0100	421.565
/get/flashplayer/update/current/xml/version_en_win_pl.xml	1				0.0000	100.00%	0.0100	421.565
4hen.com	2				0.0000	0.51%	0.0100	30.304
/favicon.ico	1				0.0000	50.00%	0.0100	30.562
/	1				0.0000	50.00%	0.0100	30.304
239.255.255.250:1900	389				0.0008	99.23%	0.1000	115.564
*	389				0.0008	100.00%	0.1000	115.564

Figure - 5.15 : Wireshark: Requests - Ethernet

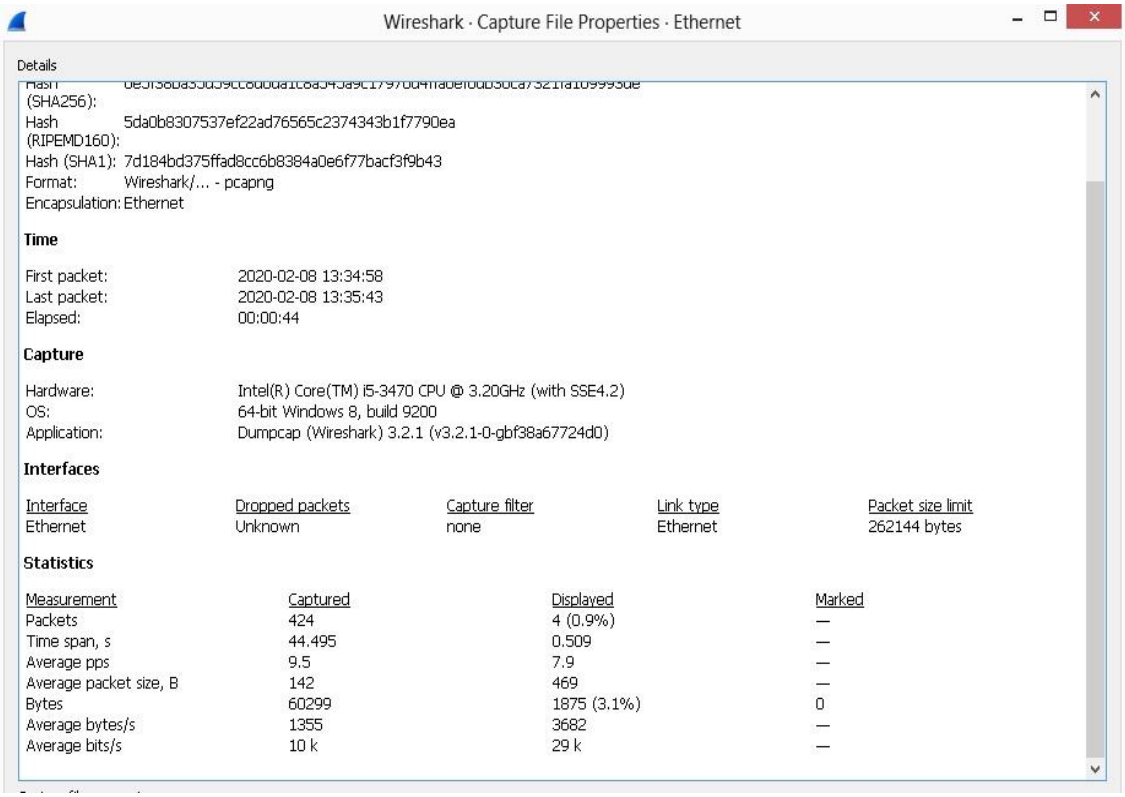


Figure - 5.16 : Wireshark: Capture File Properties - Ethernet

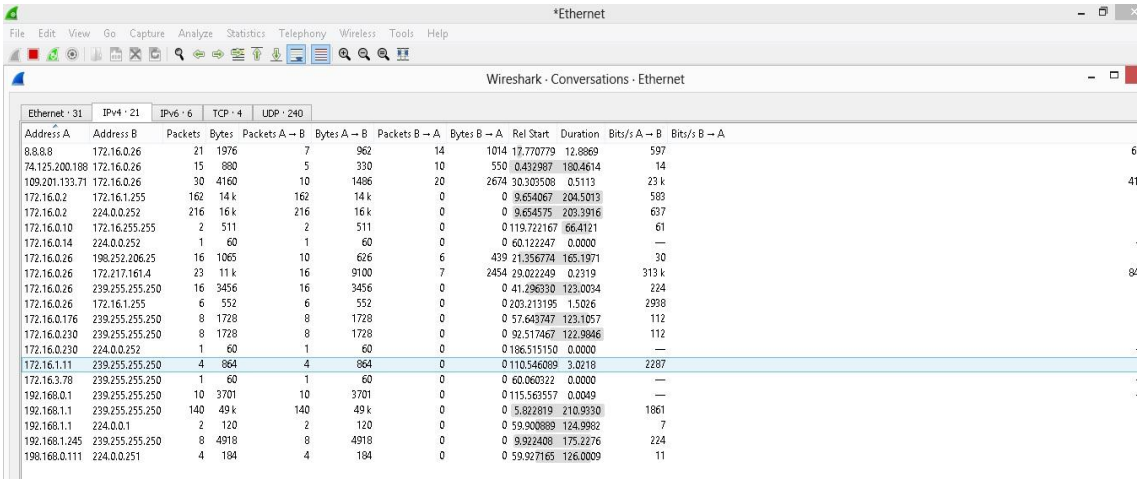


Figure - 5.17 : Wireshark: Conversation – Ethernet

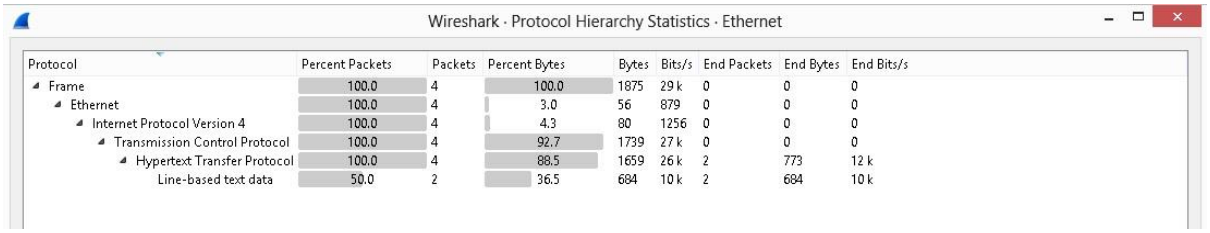


Figure - 5.18 : Wireshark: Protocol Hierarchy Statistics - Ethernet

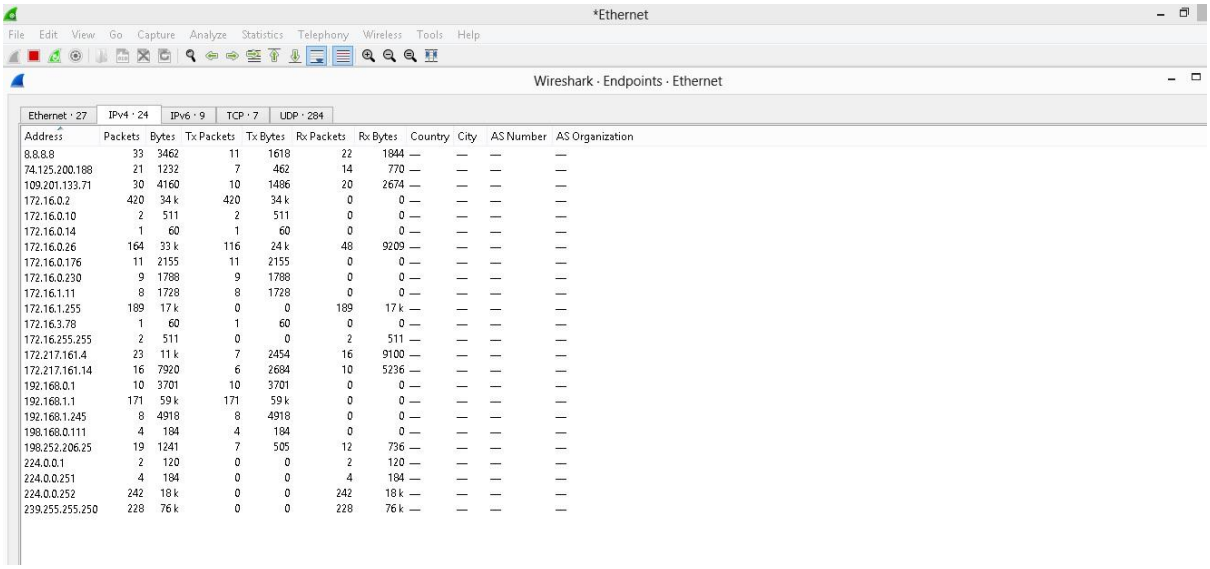


Figure - 5.19 : Wireshark: Endpoints - Ethernet

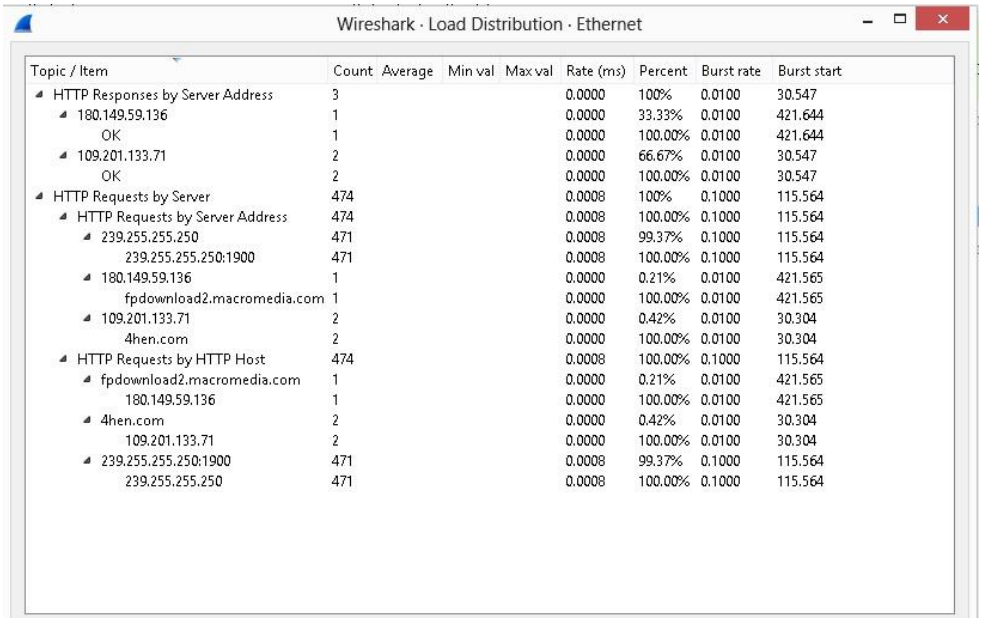


Figure - 5.20 : Wireshark: Load Distribution - Ethernet

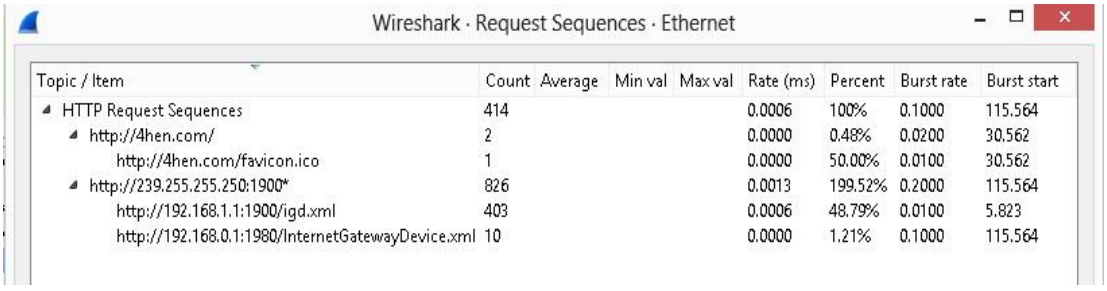


Figure - 5.21 : Wireshark: Request Sequences - Ethernet

5.3.6 Findings

The testing results reveal that the HTTP based content blocking mechanisms are being used by the ISP's in India. The website's blocking has been done in continuation of the blocking orders & list released from the department of information and technology (DOIT) in compliance with the order to ban websites by Uttarakhand High Court. This type of filtering mechanism caters to the user HTTP requests, either by dropping the requestor by responding to the censorship notice.

5.3.7 Discussion on Findings

Checking of the status of the A records for the blocked websites in India and from the US locations through the help of the online utility available at InfoByIP.com, revealed the same A records values from both the locations. Further, when it was tried to access the banned website in India, it routes the request on the basis of the HTTP header and finally got the block page of the website with the text message (Web Page Blocked! The page you have requested has been blocked because the URL is banned as per the Government Rules) and the meanwhile when accessed the same website with the United States hosted server it leads to the final destination of the website without any block page message because there is no any restriction in the United States for these websites. As per these testing and comparison of the results for two different geographical locations, lookup results for A records have been found the same. The end result indicated that for the same public IP (A public IP address is the globally unique IP address assigned to any device), one is getting two different page responses due to the HTTP based content blocking in India. In the United States, the web request with the same IP leads to the actual destination of the web page while in India, it routes to the blocked page hosted/routed by the various ISP's in India.

So on the bases of the above experimental results, one can easily interpret that the ISP’s of India often use the HTTP based content blocking mechanism to block the websites in India.

5.3.8 Conclusion

The present website blocking mechanism of the Government of India seems ineffective. It needs to address the issues with long-lasting corrective measures. In fact, the present blocking mechanism is not sustainable to achieve its goals at the grass-root level. The blocking mechanism used by the ISP's is low cost and can be quickly implemented, but the major flaw is that there is no blocking of proxy sites and tor relay nodes. No daily routine

monitoring and update of blocked websites and scanning of user traffic at different layers and ports of the OSI / TCPIP model. It is not a holistic solution to block the request for the unwanted sites at different levels. It was observed that the blocked websites are easily accessible with the help of the VPN browsers, tor relay nodes, and proxy sites. There are numerous pornographic websites available on the internet, so it does not seem practical to block it with the help of ISP's using single blocking techniques only. India has to think of an integrated, holistic model for web content filtering and blocking.

II. DNS Tampering

Domain Name System (DNS) translates the user requested website address (URL) to its corresponding IP address. This is the primary step in accessing a website by the user. DNS record tempering achieved through the help of following techniques –

(a) DNS Poisoning Techniques: In this technique, the user website request forwarded to the DNS server and preconfigured DNS server match the user request with the blacklist database and provides no response against the user request. The user browser not gets any lookup results, and this user request and results go under the iterative situation.

(b) DNS Spoofing Techniques: In this technique, user website requests forwarded to the DNS server and preconfigured DNS server match the user request with the blacklist database, and ISPs intercept the actual DNS record response and inject the incorrect IP response against the user request. An intercepted IP address serves the block page to the user.

5.3.9 Findings

The testing results reveal that no evidence of DNS tampering found. A list of blocked websites has been resolving with the successful lookup records. Approx, 83% websites, are resolving with the successful lookup answers, 1% of websites having Error 9002 in lookup results, and 15% websites domain name having Error 9003 in lookup results resolution. The websites had no lookup results, approx 70% websites domain name available for purchase, 13% websites domain name not available for purchase (under the transition period of domain purchase rules and regulation), and 16% of websites operating with the Cname Records. In further investigation for the Cname records issue websites with their Top-Level-Domain (TLD) lookup approx 52% of websites domain name available for purchase for these websites no any PTR records associated with the Cname domain, Approx 30% of websites domain name having the Country Code Top-Level-Domain (ccTLD) issues in lookup results and approx 17% website domain name not available for purchase (under the transition period of domain purchase rules and regulation)

5.3.10 Experimental Results: Analysis and Discussion

While studying the status of A record lookup of the websites blocked by the Government of India, the researcher has taken the list of 843 banned websites and try to find out the A record lookup against the selected list with the help of DNSDataView tool. The result shows that the DNS server resolving the IP addresses of the 701 websites successfully no any evidence of DNS tampering found. The analysis result of the A record shows the successful lookup answer for 701 websites. 133 websites lookup results replied with the Error 9003 (), and 9 websites lookup results replied with Error 9002 (). No, any PTR records found for the 133 websites. The researcher conducted the test to get the status of these 133 websites with the help of Godaddy bulk domain utility; out of these 133 websites, 100 websites domain name available for purchase. It concluded that 100 domain name expires and available for purchase 19 domain name unavailable for purchase (in the transition period) of domain name purchase availability rest 23 domain name listed with the cname record in the banned list. While further investigation for these 23 cname records with their Top-Level-Domain (TLD), the researcher found 12 domain names available for purchase 04 domain name unavailable for purchase (in the transition period) rest 07 domain name having the Country Code Top-Level-Domain (ccTLD) issues in lookup results.

Table - 5.12 : A Records Wise Websites Status				
Record Type	**Answer**	**Error 9002**	**Error 9003**	**Grand Total**
A	701	9	133	843
No of Domains	701	9	133	843

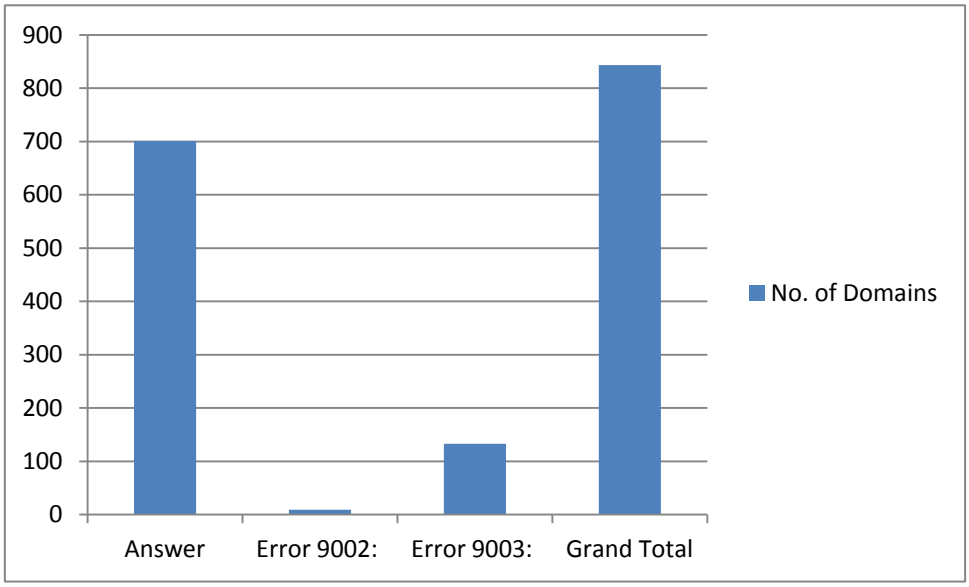


Figure - 5.22 : A Records Wise Websites Status

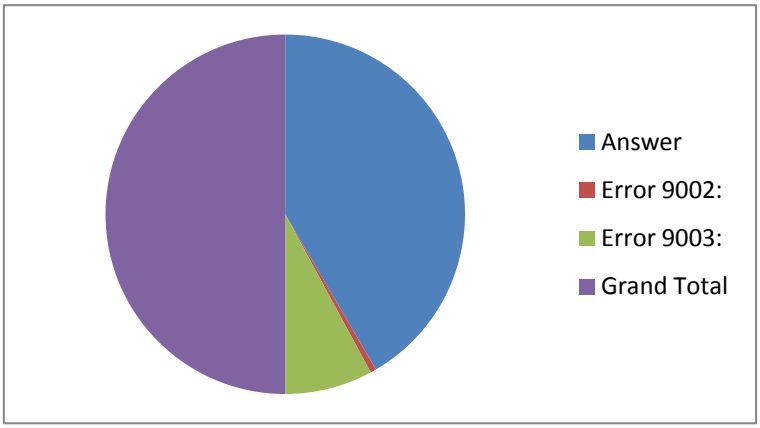


Figure - 5.23 : % Wise A Records Websites Status

Table - 5.13 : Error 9002 and 9003 Wise Website Status	
Status of websites (Error 9002 and 9003)	No. of Domains
Domain Name Available for Purchase	100
Domain Name Unavailable for Purchase	19
Cname Records	23

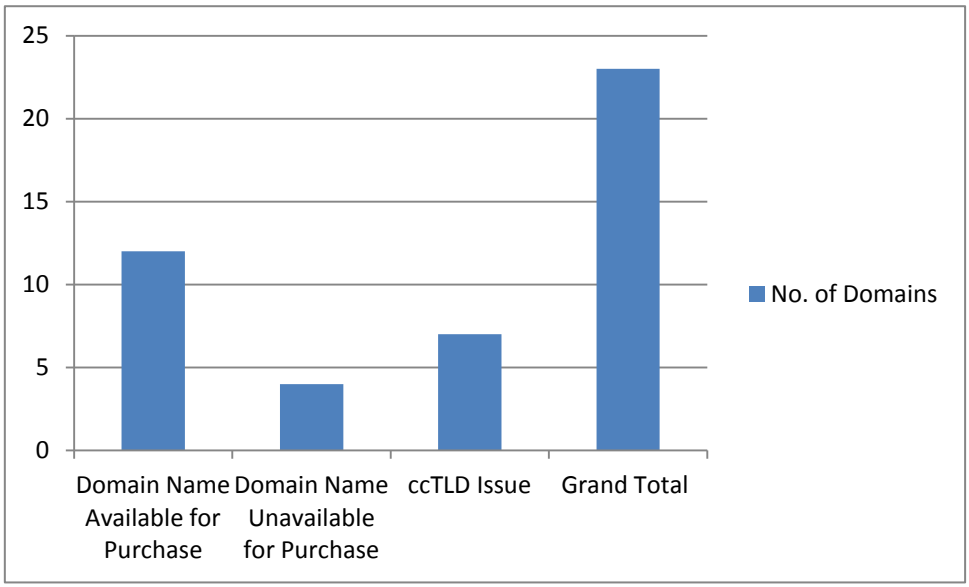


Figure - 5.24 : Error 9002 and 9003 Wise Website Status

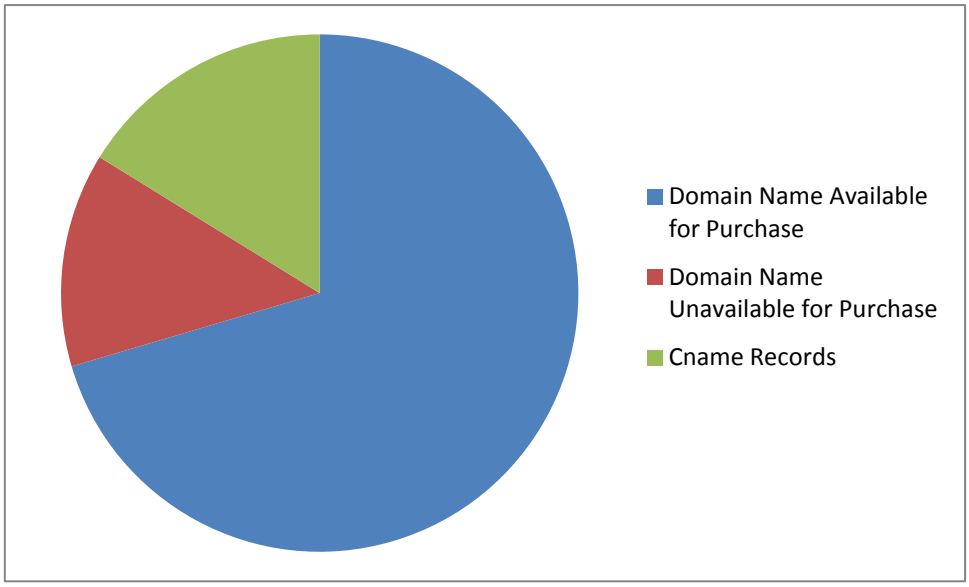


Figure - 5.25 : % Wise Error 9002 and 9003 Website Status

Table - 5.14 : Status of Websites without Subdomain Records	
Status of Websites without Subdomain	No. of Domains
Domain Name Available for Purchase	12
Domain Name Unavailable for Purchase	4
ccTLD Issue	7

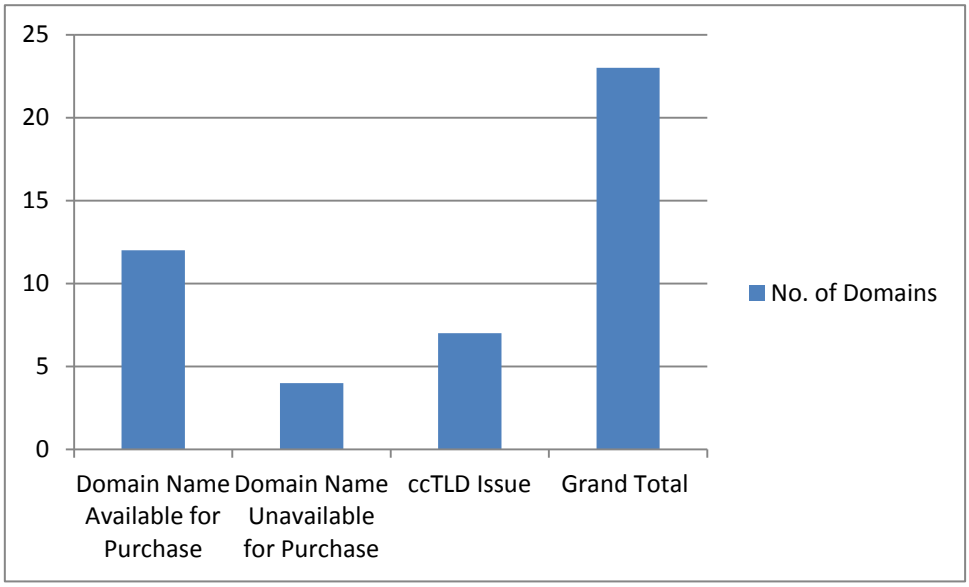


Figure - 5.26 : Status of Websites without Subdomain

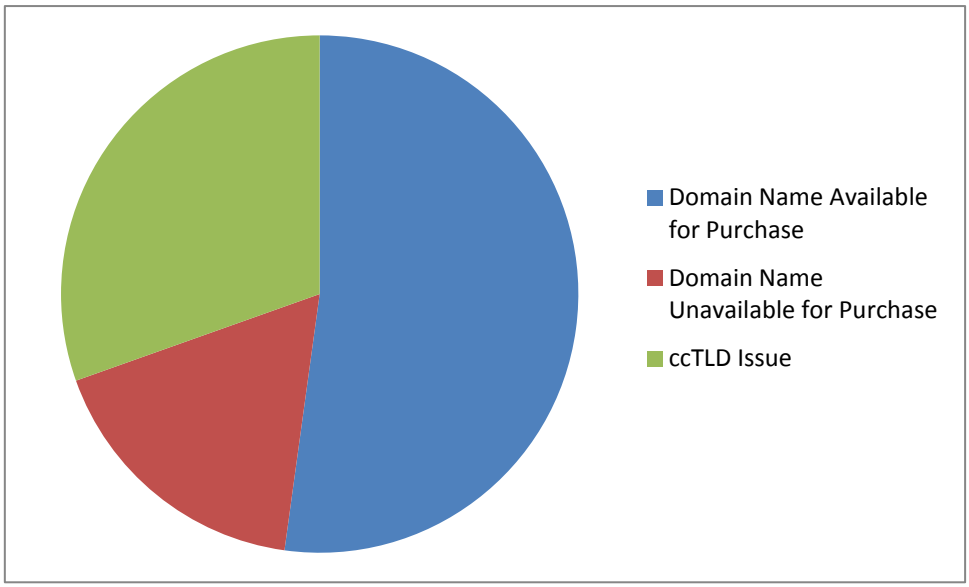


Figure 5.27 - % Wise Status of Websites without Subdomain

III. **TCP IP Blocking:** TCP/IP based blocking techniques inspect the IP packet header information and check the destined IP address based on the pre-configured blacklist in the system. In the present, era hosted systems on single public IP provide multiple services like website hosting, email services, etc. In this type of blocking, all the associated services with the blocked IP get stopped working. In the case of virtual hosting multiple websites hosted on the same server and use the same public IP to access multiple websites. IP based blocking techniques severely affected the performance and inaccessibility of the websites hosted on the virtual environment and shared hosting. To overcome this problem, blocking performed precisely not on IP address while based on the port number, which information already available in the TCP/IP header. Based on the user request system, check the associated service with port number and drop the packet information destined to the associated port number

5.3.11 Findings

The testing result reveals that no any kind of evidence found for TCP/IP based blocking. A list of the majority of blocked websites has been resolving with the successful ping responses from legitimate IP addresses. Approx 67% websites resolving with the successful ping replies, 1% websites having destination port unreachable response, approx 16% websites having bad hostname responses means no any pointer record addressing the hosted website IP address and approx 15% of websites having request time out responses means server tuned the Internet Control Message Protocol (ICMP) to drop the ICMP echo request packets. To ensure the status of the request time out websites researcher conducted the HTTP 3-way handshake to these website addresses and more than 85% of websites resolving with HTTP 200 response code, it supported the fining that ICMP request drop at server level forcefully. In support of bad hostname responses, the researcher conducted the lookup results for these websites with the help of the DNS data view tool and found the error code response 9003, which further supports the findings that no pointer records associated with these websites. 67% of the website's success response implies that no kind of filtering being used by the ISPs to filter the traffic based on the destination IP address. Further, the researcher used the network protocol analyzer tool named Wireshark for further more investigation to improve the accuracy of results. The finding of a network protocol analyzer tool also supports the

findings that websites hosted server tuned to drop the ICMP request-response for theses websites.

Table - 5.15 : Reply Status of Website	
Status	**Count of Host Name**
Bad Host Name	142
Destination Port Unreachable	1
Request Timeout	127
Succeeded	573
Grand Total	843

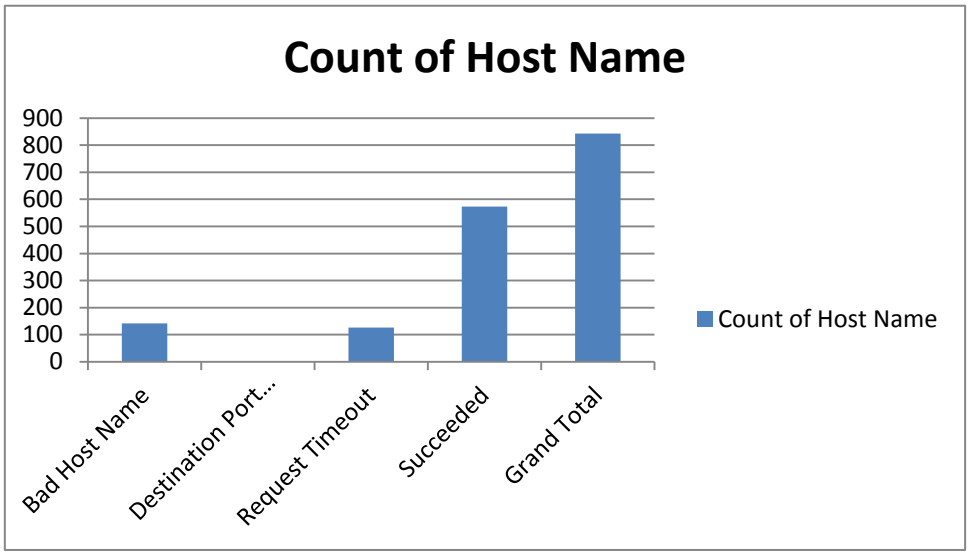


Figure - 5.28 : Reply Status of Website

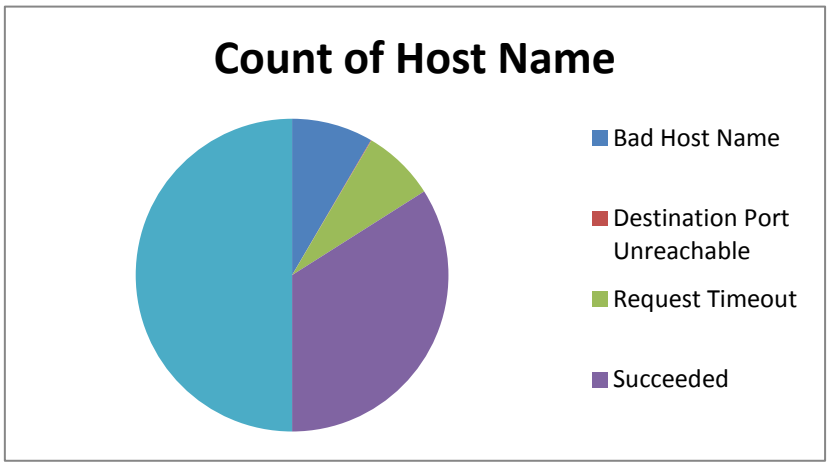


Figure - 5.29 : % Wise Reply Status of Website

Table - 5.16 : Reply Status with Success Response	
Status	**Count of Host Name**
Succeeded	573
Grand Total	843

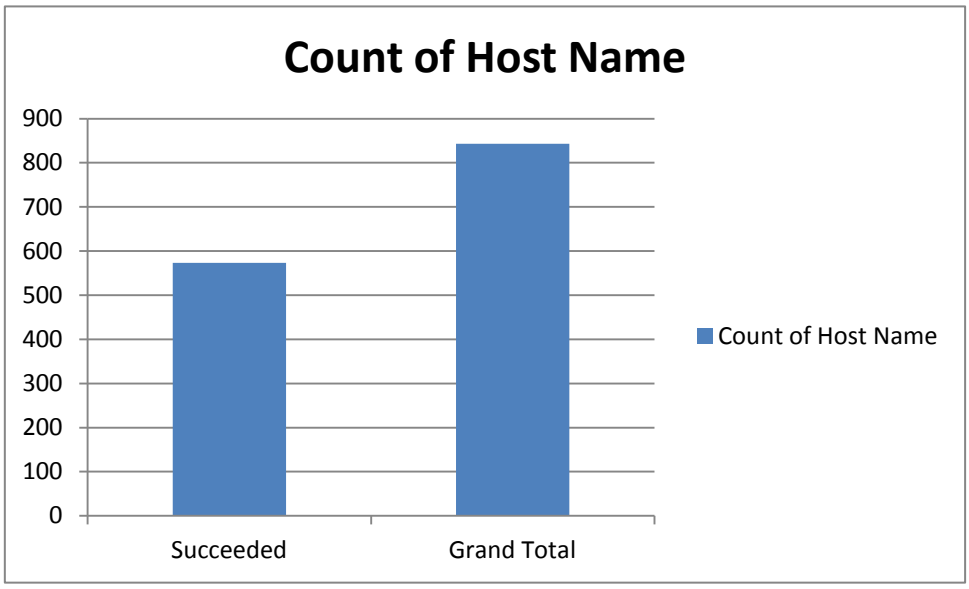


Figure - 5.30 : Reply Status with Success Response

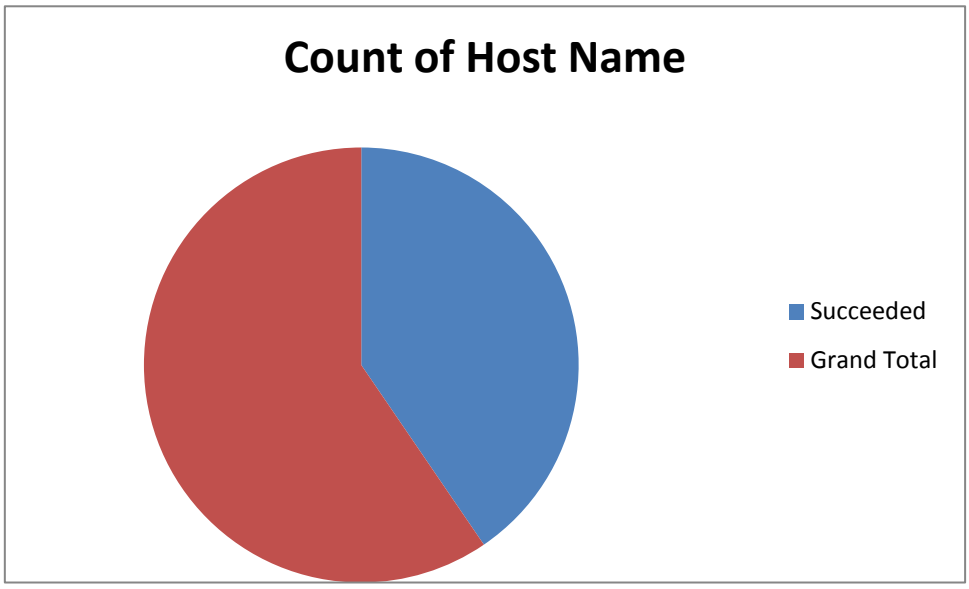


Figure - 5.31 : % Wise Reply Status of Website

Table - 5.17 : Status Code Response for Request Time out Records			
Status	**200**	300	**Grand Total**
OK	108	-	108
Other	-	19	19
Grand Total	108		127

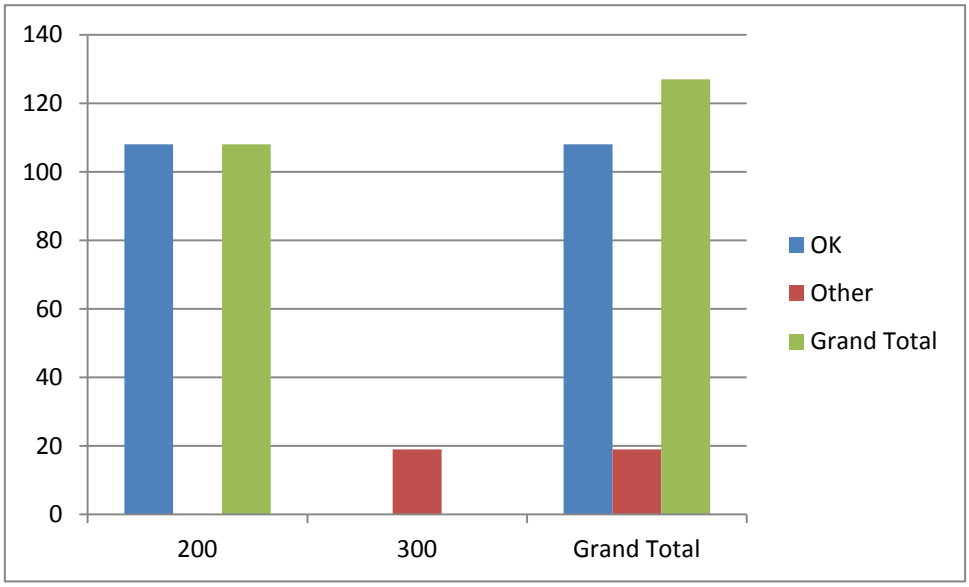


Figure - 5.32 : Status Code Response for Request Time Out Records

Table - 5.18 : Status Code Response for Bad Host Name Records	
Error Code	No of Host
Error 9002	9
Error 9003	133

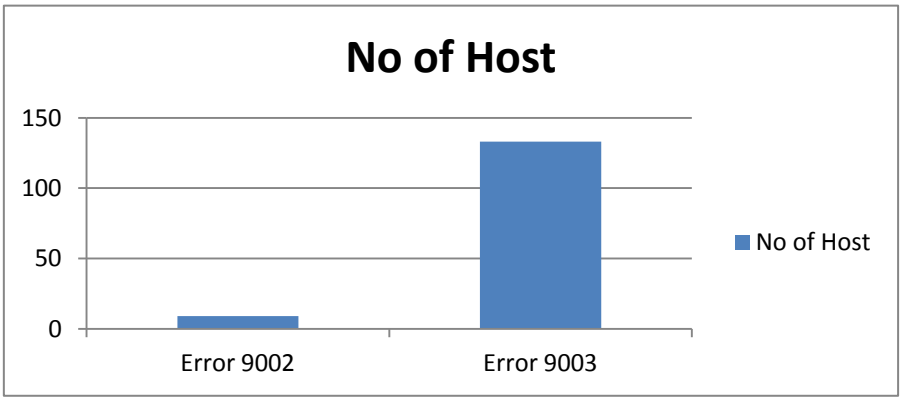


Figure - 5.33 : Status Code Response for Bad Host Name Records

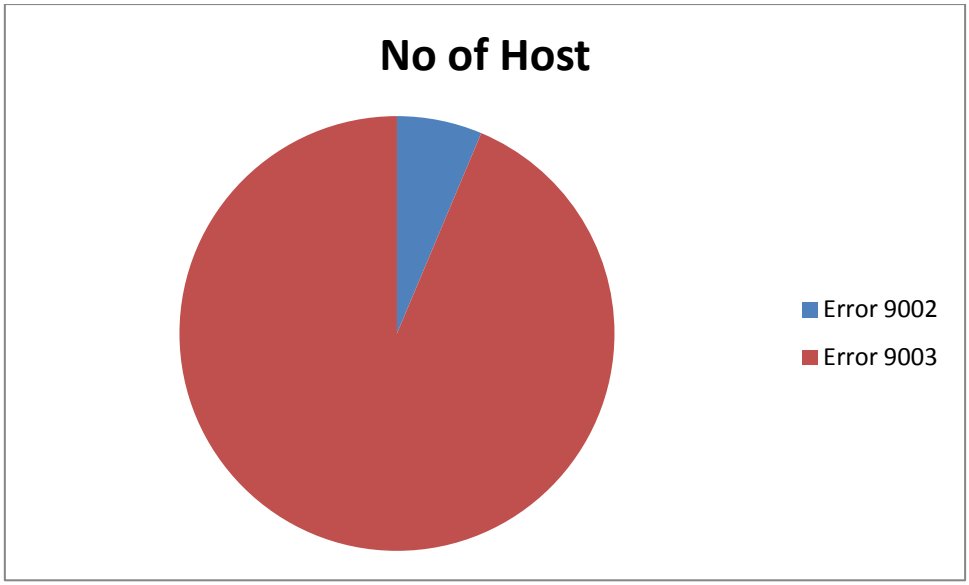


Figure - 5.34 : % Wise Status Code Response for Bad Host Name Records

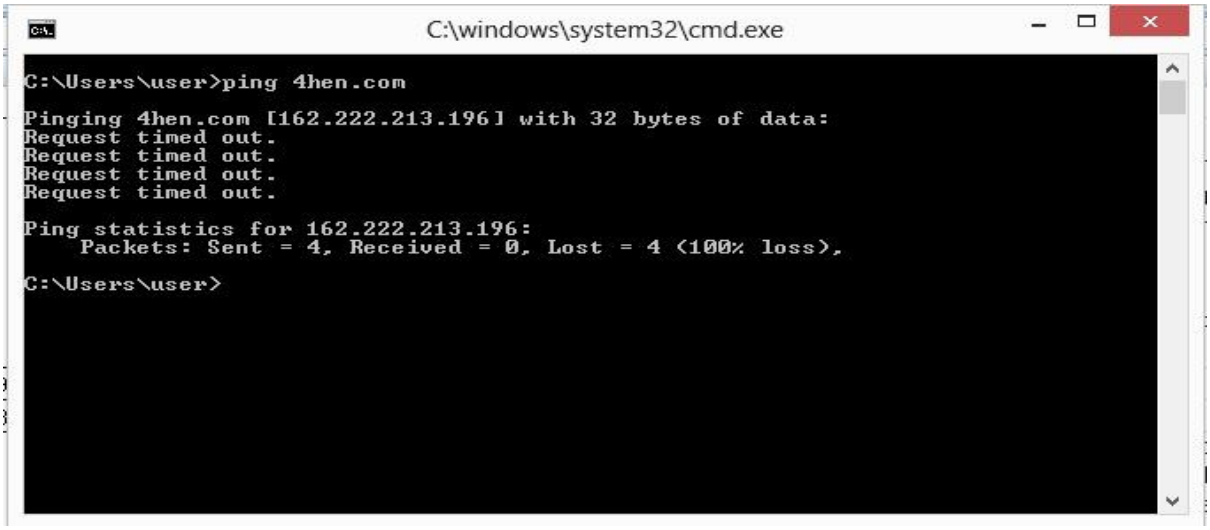


Figure - 5.35 : ICMP Request

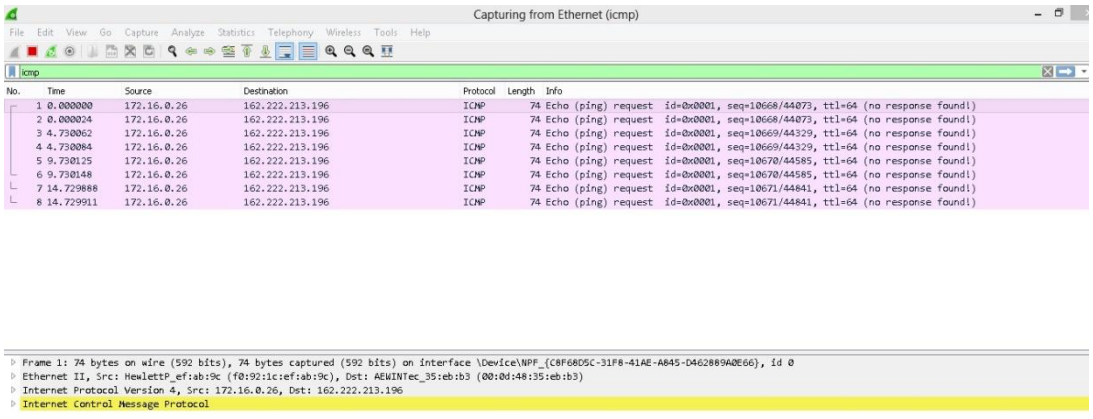


Figure - 5.36 : Wireshark: ICMP Request Response

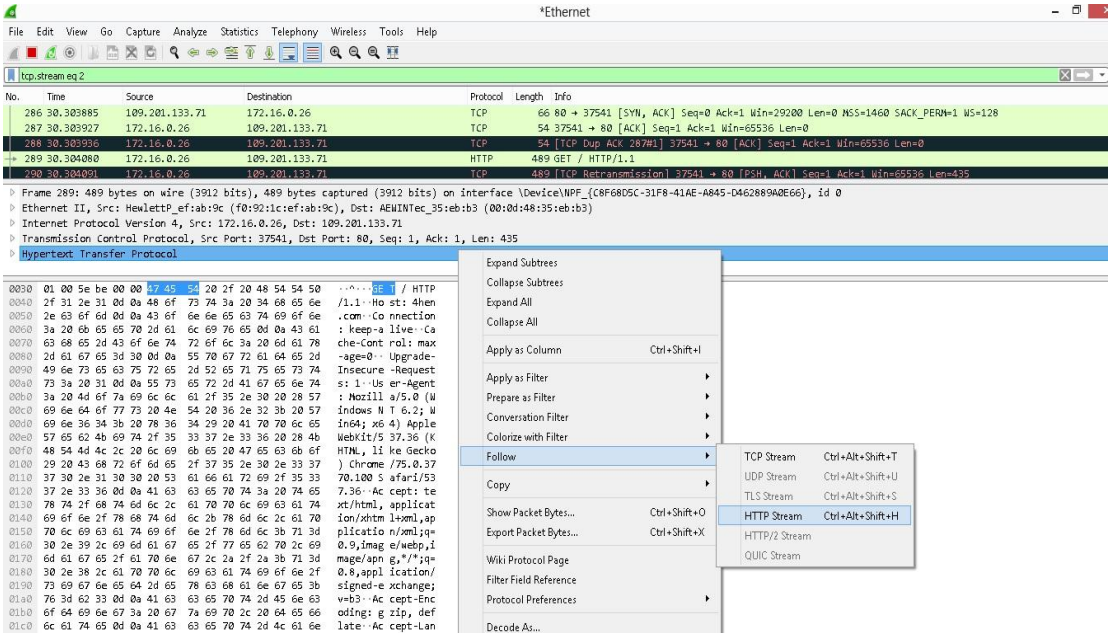


Figure - 5.37 : Wireshark: HTTP Steam Request

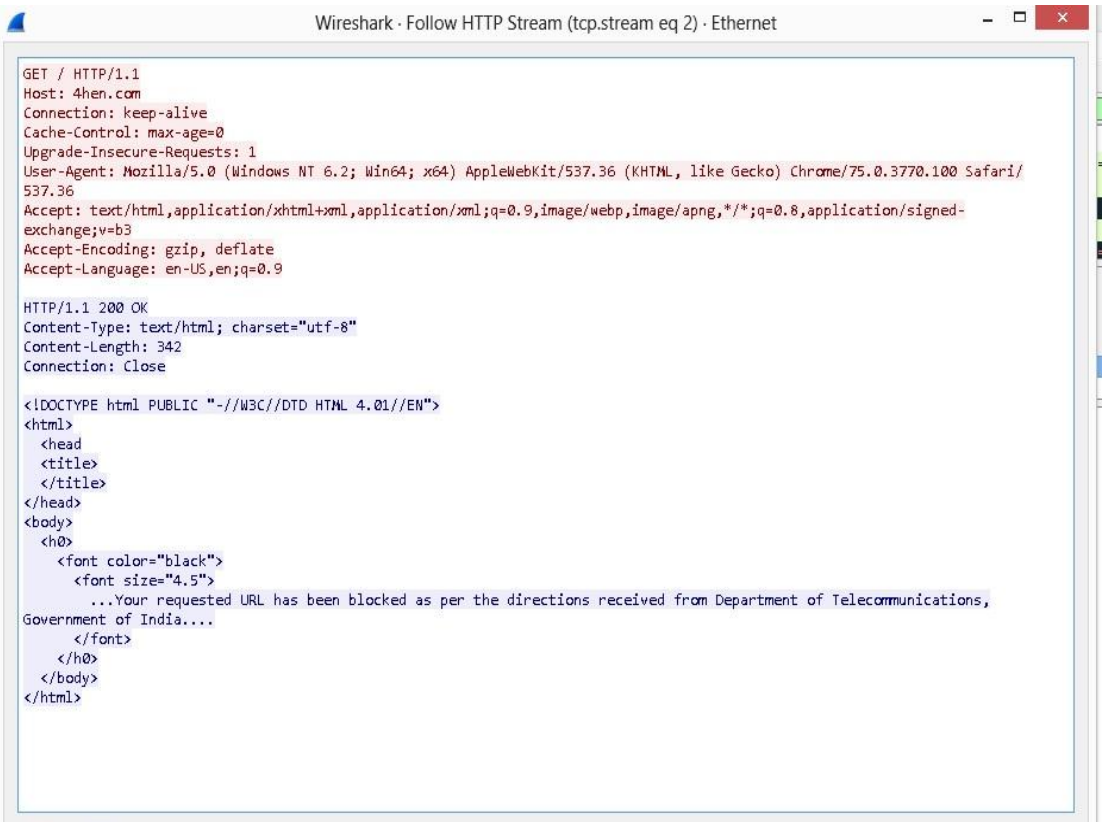


Figure - 5.38 : Wireshark: HTTP Steam Output

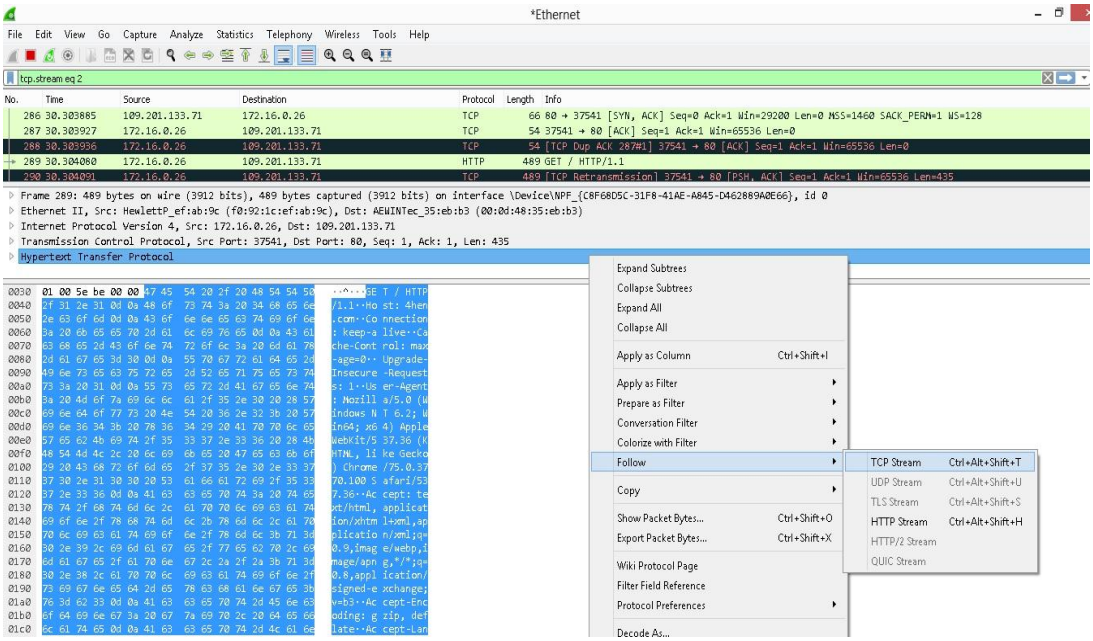


Figure - 5.39 : Wireshark: TCP Steam Request

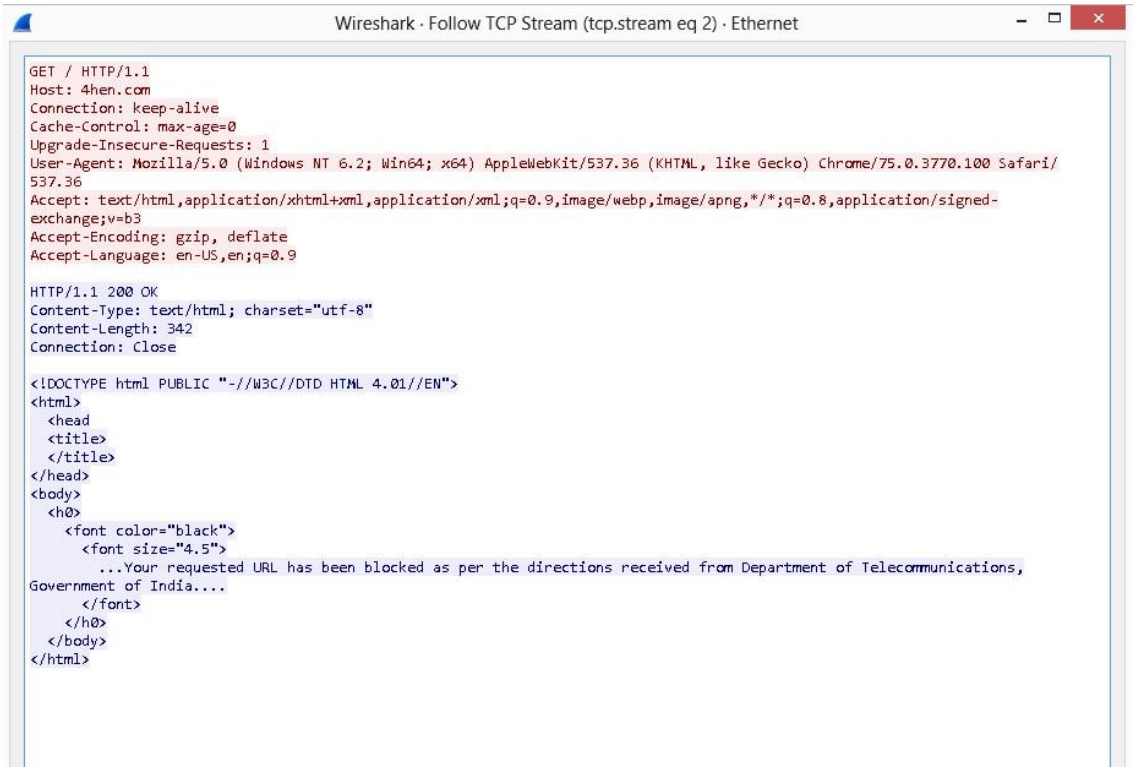


Figure - 5.40 : Wireshark: TCP Steam Output

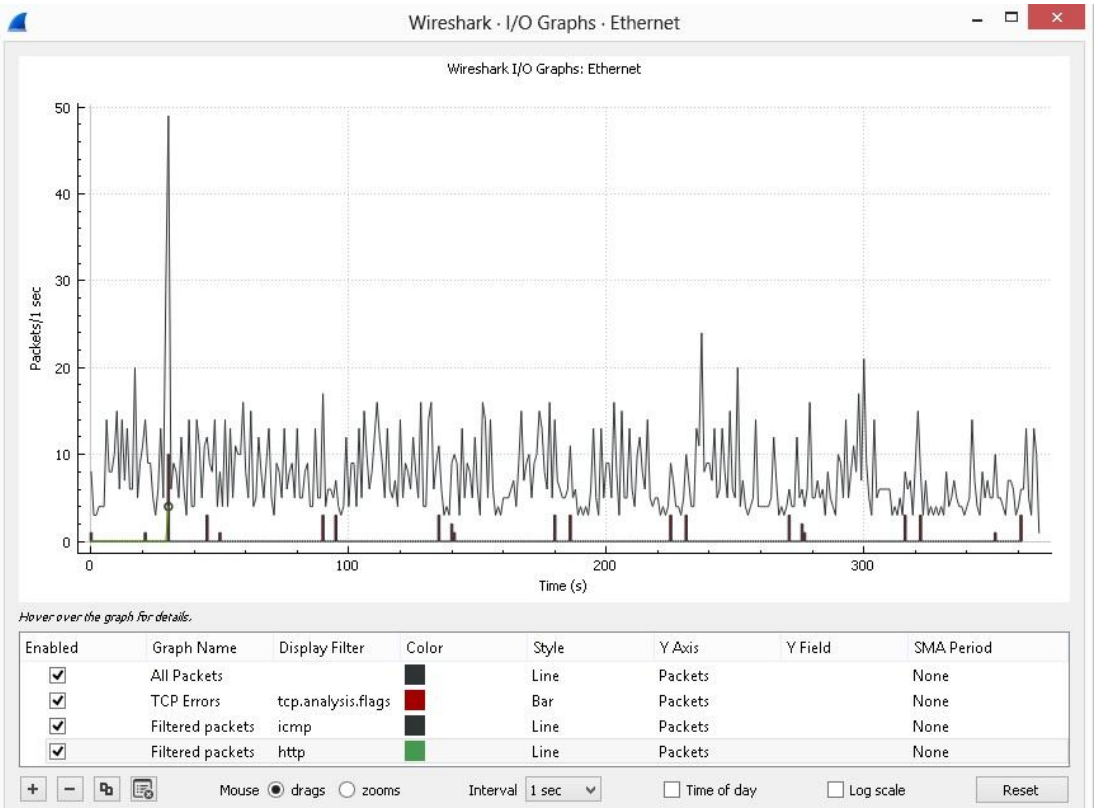
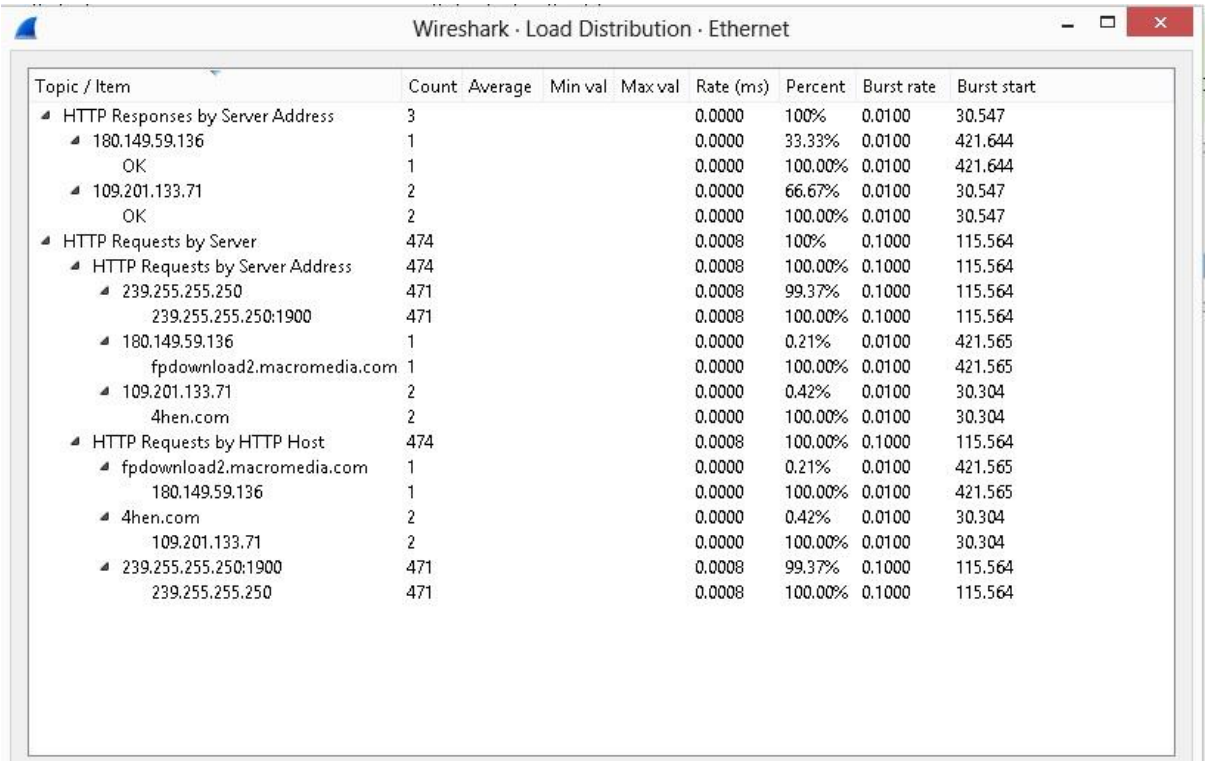


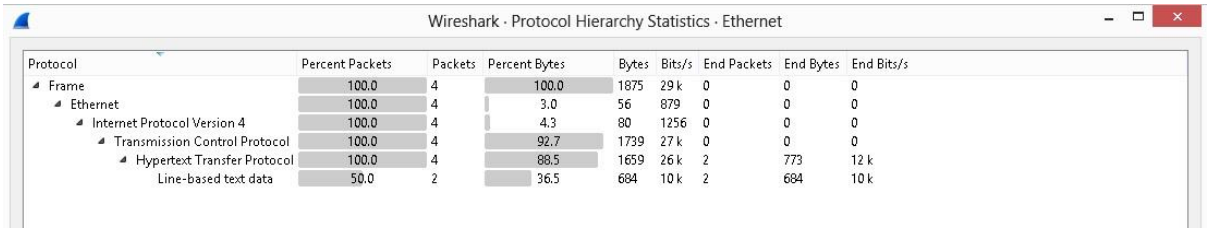
Figure - 5.41 : Wireshark: I/O Graphs - Ethernet

Figure - 5.42 : Wireshark: Flow - Ethernet



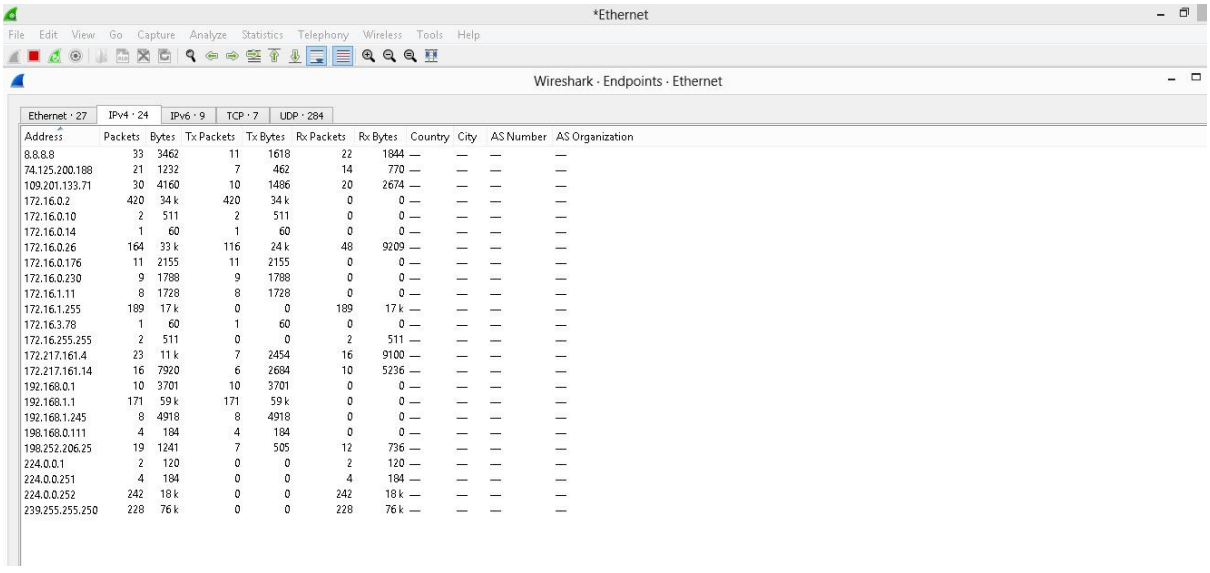
Topic / Item	Count	Average	Min val	Max val	Rate (ms)	Percent	Burst rate	Burst start
HTTP Responses by Server Address	3				0.0000	100%	0.0100	30.547
180.149.59.136	1				0.0000	33.33%	0.0100	421.644
OK	1				0.0000	100.00%	0.0100	421.644
109.201.133.71	2				0.0000	66.67%	0.0100	30.547
OK	2				0.0000	100.00%	0.0100	30.547
HTTP Requests by Server	474				0.0008	100%	0.1000	115.564
HTTP Requests by Server Address	474				0.0008	100.00%	0.1000	115.564
239.255.255.250	471				0.0008	99.37%	0.1000	115.564
239.255.255.250:1900	471				0.0008	100.00%	0.1000	115.564
180.149.59.136	1				0.0000	0.21%	0.0100	421.565
fpdownload2.macromedia.com	1				0.0000	100.00%	0.0100	421.565
109.201.133.71	2				0.0000	0.42%	0.0100	30.304
4hen.com	2				0.0000	100.00%	0.0100	30.304
HTTP Requests by HTTP Host	474				0.0008	100.00%	0.1000	115.564
fpdownload2.macromedia.com	1				0.0000	0.21%	0.0100	421.565
180.149.59.136	1				0.0000	100.00%	0.0100	421.565
4hen.com	2				0.0000	0.42%	0.0100	30.304
109.201.133.71	2				0.0000	100.00%	0.0100	30.304
239.255.255.250:1900	471				0.0008	99.37%	0.1000	115.564
239.255.255.250	471				0.0008	100.00%	0.1000	115.564

Figure - 5.43 : Wireshark: Load Distribution - Ethernet



Protocol	Percent Packets	Packets	Percent Bytes	Bytes	Bits/s	End Packets	End Bytes	End Bits/s
Frame	100.0	4	100.0	1875	29 k	0	0	0
Ethernet	100.0	4	3.0	56	879	0	0	0
Internet Protocol Version 4	100.0	4	4.3	80	1256	0	0	0
Transmission Control Protocol	100.0	4	92.7	1739	27 k	0	0	0
Hypertext Transfer Protocol	100.0	4	88.5	1659	26 k	2	773	12 k
Line-based text data	50.0	2	36.5	684	10 k	2	684	10 k

Figure 5.44 – Wireshark: Protocol Hierarchy Statistics - Ethernet



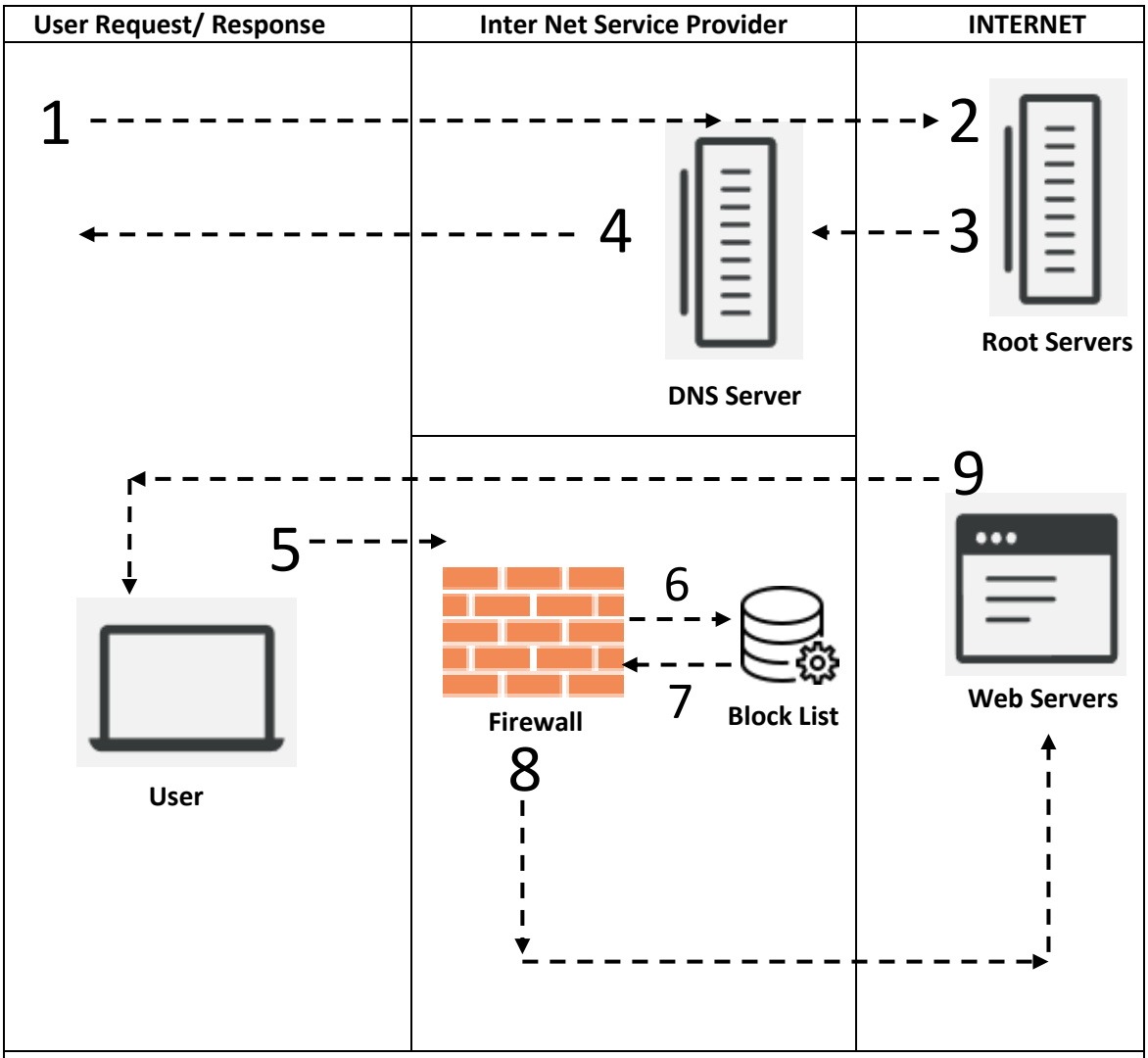
Address	Packets	Bytes	Tx Packets	Tx Bytes	Rx Packets	Rx Bytes	Country	City	AS Number	AS Organization
8.8.8.8	33	3462	11	1618	22	1844	—	—	—	—
74.125.200.188	21	1232	7	462	14	770	—	—	—	—
109.201.133.71	30	4160	10	1486	20	2674	—	—	—	—
172.16.0.2	420	34 k	420	34 k	0	0	—	—	—	—
172.16.0.10	2	511	2	511	0	0	—	—	—	—
172.16.0.14	1	60	1	60	0	0	—	—	—	—
172.16.0.26	164	33 k	116	24 k	48	9209	—	—	—	—
172.16.0.176	11	2155	11	2155	0	0	—	—	—	—
172.16.0.230	9	1788	9	1788	0	0	—	—	—	—
172.16.1.11	8	1728	8	1728	0	0	—	—	—	—
172.16.1.255	189	17 k	0	0	189	17 k	—	—	—	—
172.16.3.78	1	60	1	60	0	0	—	—	—	—
172.16.255.255	2	511	0	0	2	511	—	—	—	—
172.217.161.4	23	11 k	7	2454	16	9100	—	—	—	—
172.217.161.14	16	7920	6	2684	10	5236	—	—	—	—
192.168.0.1	10	3701	10	3701	0	0	—	—	—	—
192.168.1.1	171	59 k	171	59 k	0	0	—	—	—	—
192.168.1.245	8	4918	8	4918	0	0	—	—	—	—
198.168.0.111	4	184	4	184	0	0	—	—	—	—
198.252.206.25	19	1241	7	505	12	736	—	—	—	—
224.0.0.1	2	120	0	0	2	120	—	—	—	—
224.0.0.251	4	184	0	0	4	184	—	—	—	—
224.0.0.252	242	18 k	0	0	242	18 k	—	—	—	—
239.255.255.250	228	76 k	0	0	228	76 k	—	—	—	—

Figure - 5.45 : Wireshark: Endpoints - Ethernet

5.3.12 Experimental Results: Analysis and Discussion of Findings

While studying the status of ping responses of the blocked websites by the Government of India, the researcher has taken the list of 843 websites and analyze the ping responses of these websites. The result shows that 573 websites successfully responded during ping analyses. It means that no kind of supporting evidence found for TCP/IP based blocking. 142 websites responses bad hostnames researcher conducted the test with DNSdataview tool to know the error response while resolving the host. For 133 websites test result shows the error 9003 and for 09 websites 9002 error. It supported that 142 websites not associated with the PTR records. 127 websites responded request time out to investigate in detail the researcher conducted the HTTP response code analysis to ensure the findings. The test result represents that 200 response codes for 108 websites and the rest code for 19 websites. It concluded that the majority of 127 websites working correctly with the response code 200.

Present Network Architecture of Blocking

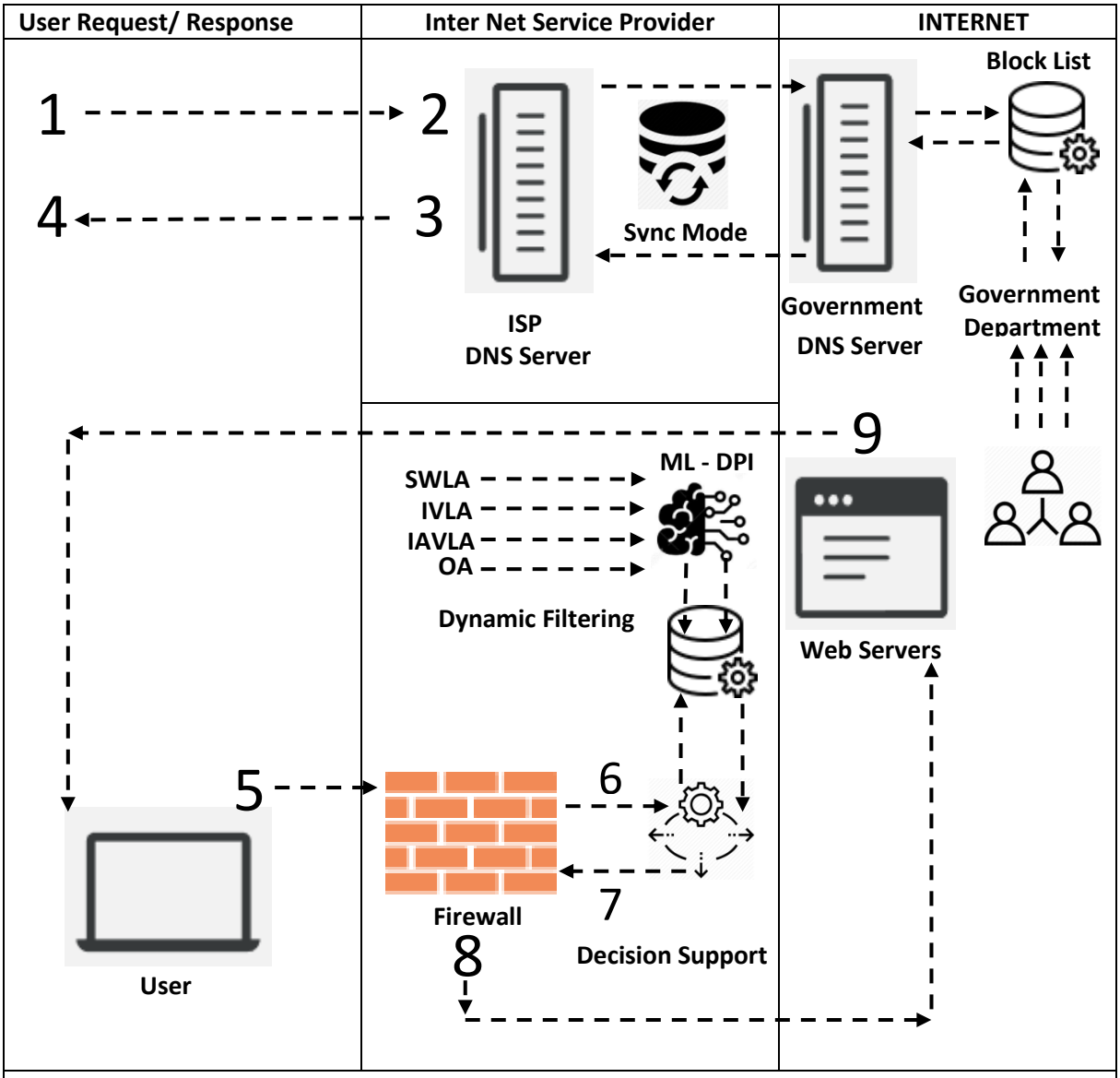


1 – User request for www.google.com
2 – DNS lookup for www.google.com
3 – Lookup response www.google.com is 192.168.1.1
4 – www.google.com is 192.168.1.1
5 – Request forwarded to the web server at 192.168.1.1 to get the web page of www.google.com
6 – Firewall device match the user request with block list database entries
7 – If user request match with blocked list database entries 192.168.1.1 device serve the block page
8 – If user request not matched with block list user request forwarded to web server to serve the webpage
9 – web server serve the web page of www.google.com to user

5.4 Objective No. 4

To design network architecture & algorithms to filter and control unsolicited web content in India.

Proposed Network Architecture of Functional Model



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6 – Firewall device match the user request with available signature / pattern alerts in decision support system
7 – If user request matched with any signature available in decision support system : RESET / other action taken for the user connection
8 – If user request not matched with any signature user request forwarded to web server 192.168.1.1 to serve the webpage
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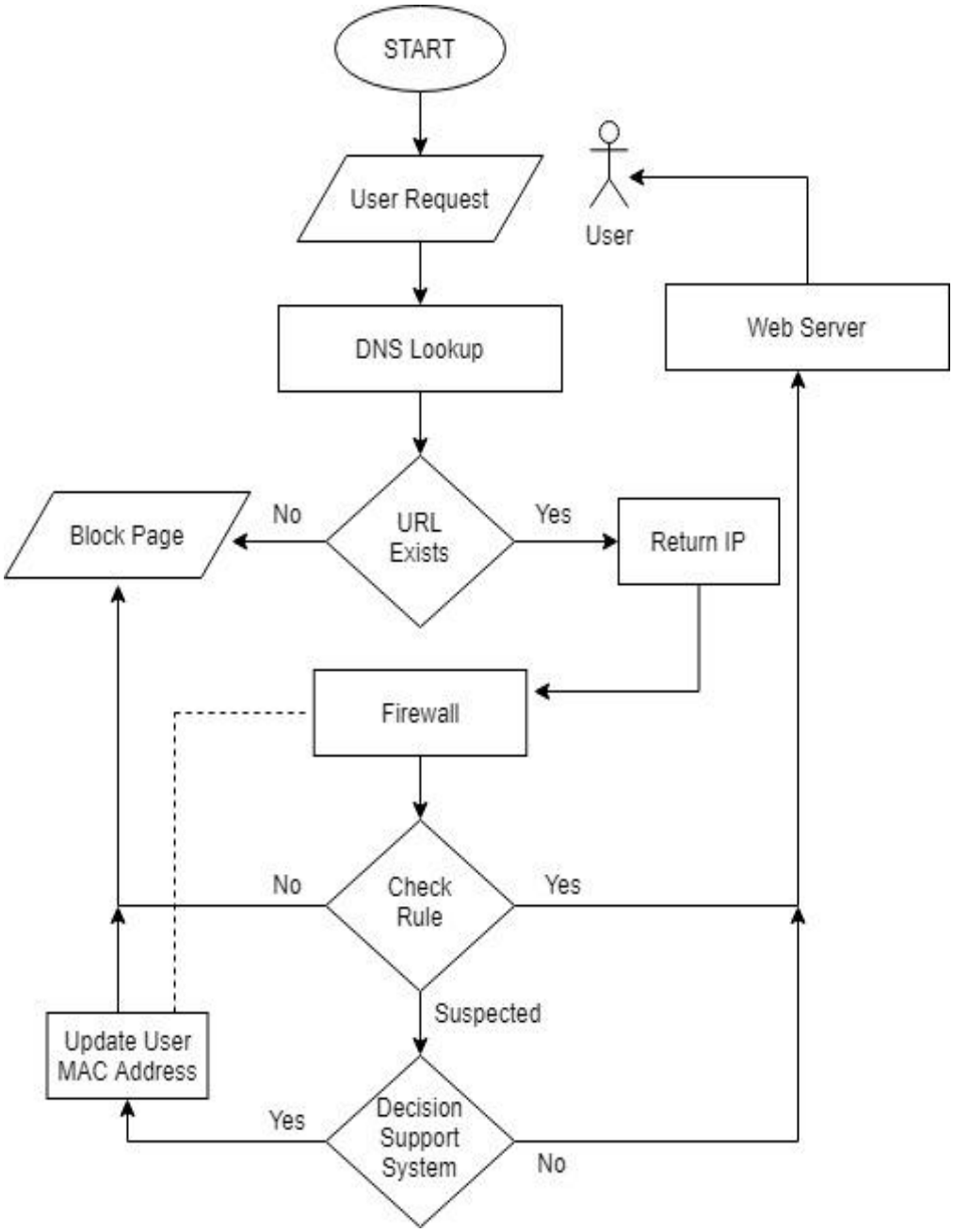
FUNCTIONAL FLOWCHART



ALGORITHMS

GET URL ()

IF VALID

DO

LOOKUP

IF URL EXISTS ON ISP DNS SERVER

RETURN IP ADDRESS OF WEB SERVER AND GOTO FIREWALL

ELSE

DISPLAY BLOCK PAGE

FIREWALL:

X <- CHECK USER REQUEST

IF X = Y

FORWARD USER REQUEST TO WEB SERVER

ELSE IF X=N

DISPLAY BLOCK PAGE

ELSE IF X=SUSPECTED

FETCH_DECISIONSUPPORTSYSTEM (USER REQUEST)

CALL MACHINE_LEARNING_SYSTEM

MATCH ML_SIGNATTURE WITH USER REQUEST

IF MATCHED

DO

UPDATE USER MAC ADDRESS IN BLACKLIST MAC TABLE

DISPLAY BLOCK PAGE

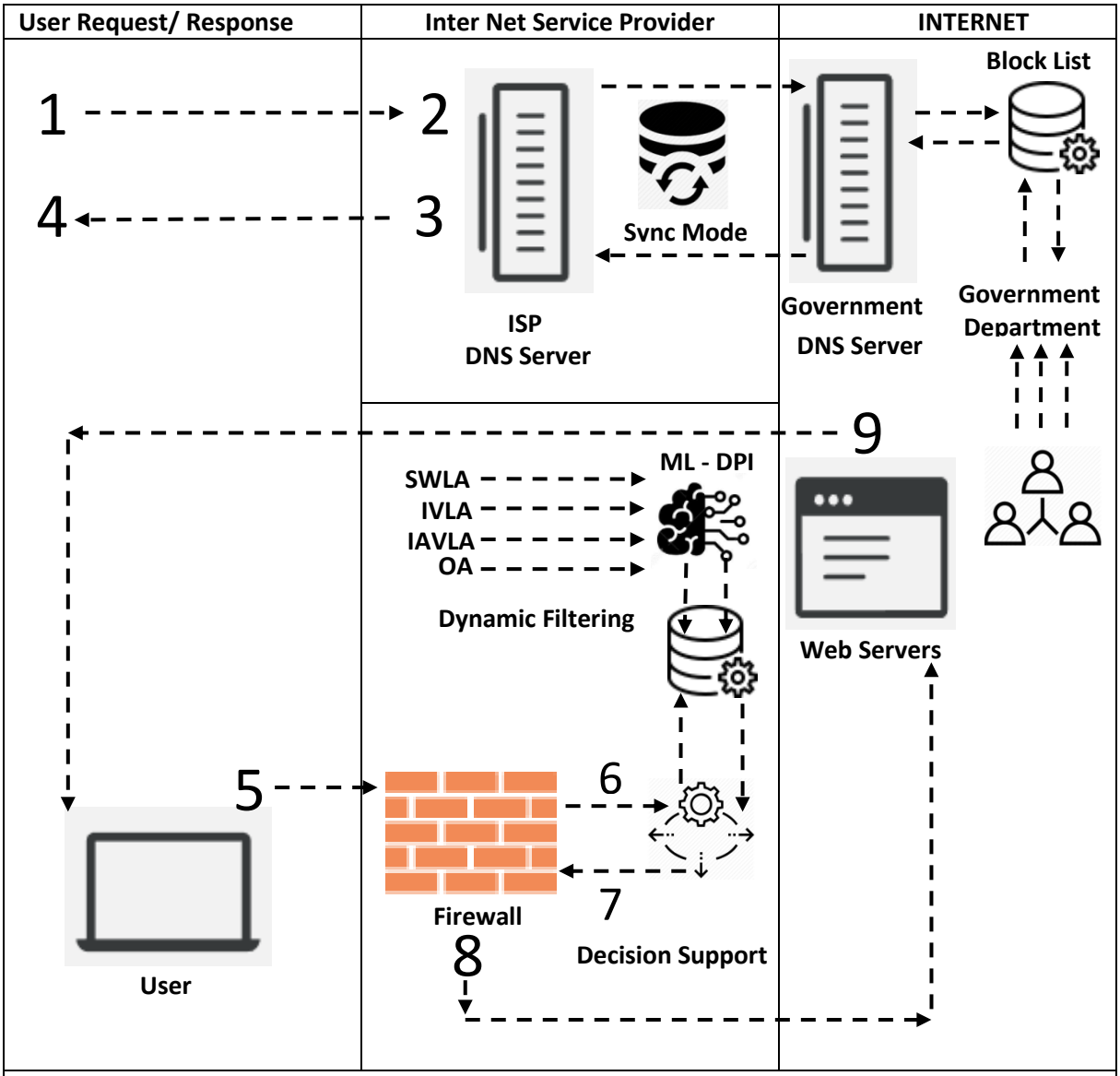
ELSE

FORWARD USER REQUEST TO WEB SERVER

5.5 Objective No. 5

A functional model in regard to filter and control unsolicited web content in India.

Functional Model



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CHAPTER 6

CONCLUSION AND SUGGESSATIONS

6.1 - This chapter deals with the objective wise conclusion.

Objective No. 1: To assess the existing policies in India to control unsolicited content.

Conclusion – After analyzing the objective number 1, its findings reveals that there are some policies in regard of prohibiting transmitting and publishing obscene content or pornographic content, but there is no policy and provision for restricting viewing of obscene / porn content in India. It is a demand of the time to frame clear policies in India to regularize and control the unsolicited content.

Objective No. 2: To investigate into the existing web content filtration mechanism in India.

Conclusion – After analyzing the objective number 2, its findings reveals that there is no any centralized mechanism at the government level for blocking and monitoring of websites in India. The primary way using to block the websites to issue the government orders to ISPs to block the websites on the basis of the provided list. The current state of affairs – On the basis of the governmental blacklist, ISPs implements the blocking activity at their network. In compliance of the Hon'ble Supreme Court direction, The Central Government constituted Inter-Ministerial Committee ("IMC") to analyze the issue in dept and recommendation to address the issue. The IMC recommended that at present no any centralized mechanism exists in India for monitoring and blocking of Child Sexual Abuse Material (CSAM), and due to the unavailability of dynamic update lists in India, all the ISPs will mandatory use The Internet Watch Foundation IWF dynamic list.

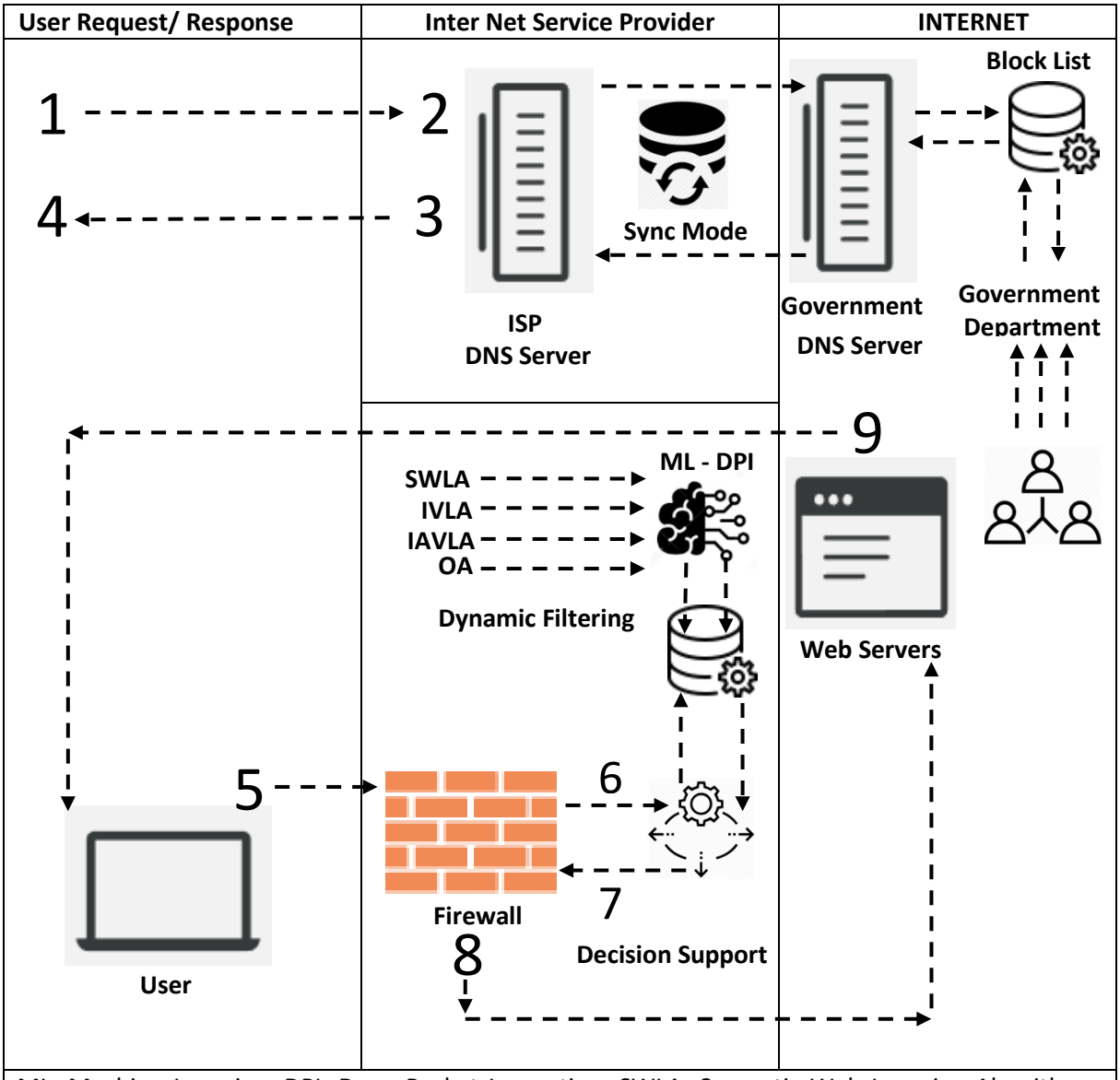
Objective No. 3: To evaluate existing network architectures of ISPs in India.

Conclusion – After analyzing the objective number 3, its findings reveals that the presently used blocking mechanism by the ISPs in India failed to block the website viewing. With TOR relays and VPN browsers, approx 95% of websites accessible quickly. The banned list of 843 websites has not included the complete list of the websites in the category of obscene content/porn. Proxy sites are not included in the blocklist. No, any provision made for the blocking at the application level and OSI model level to ensure the high-end results of blocking. The testing results find the evidences of the HTTP based content blocking

mechanism in India. No any DNS based and IP based blocking mechanism used by the ISP's in India.

Objective No. 4: To design network architecture & algorithms to filter and control unsolicited web content in India.

Proposed Network Architecture of Functional Model



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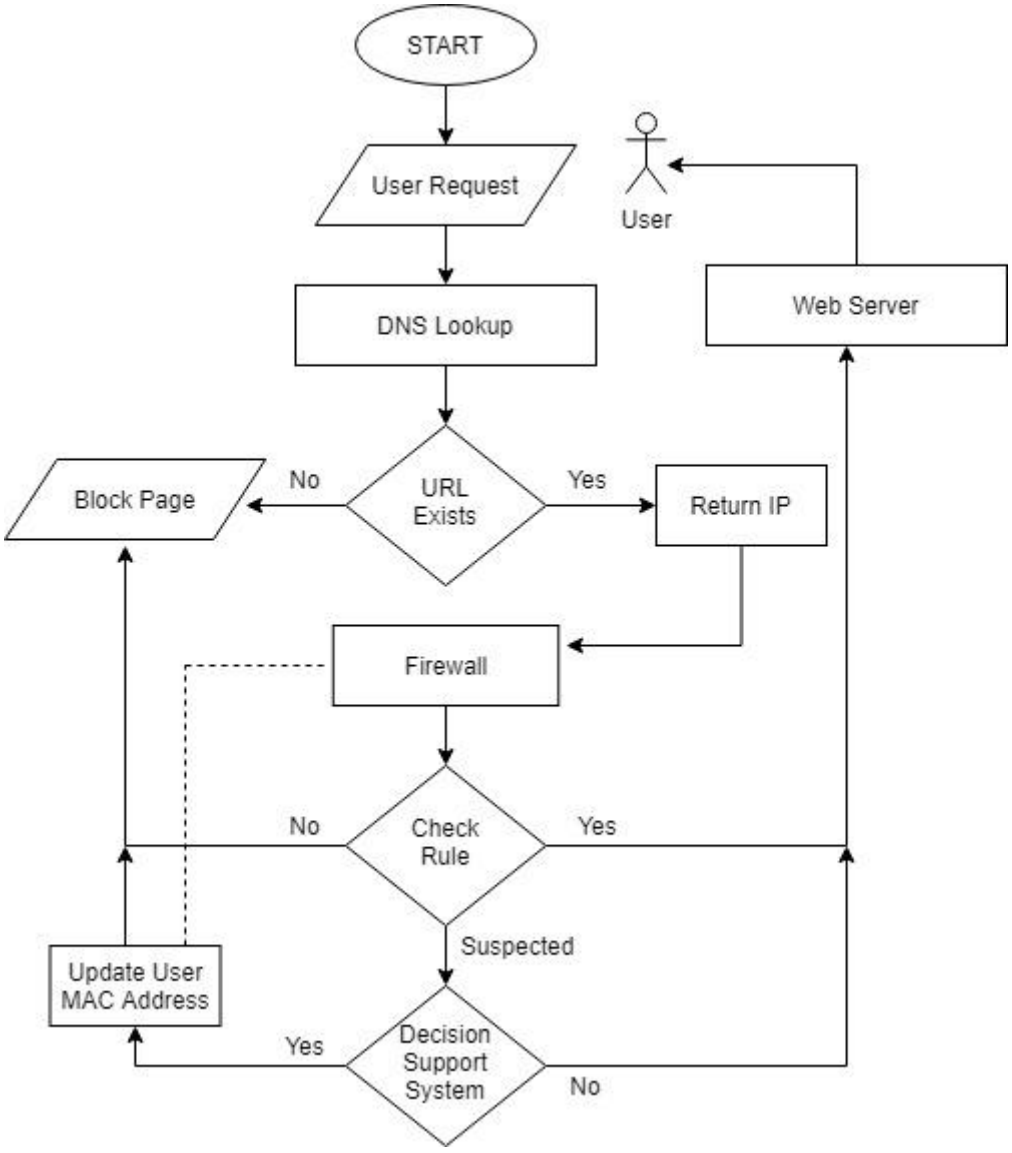

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ELSE IF X=SUSPECTED

FETCH_DECISIONSUPPORTSYSTEM (USER REQUEST)

CALL MACHINE_LEARNING_SYSTEM

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IF MATCHED

DO

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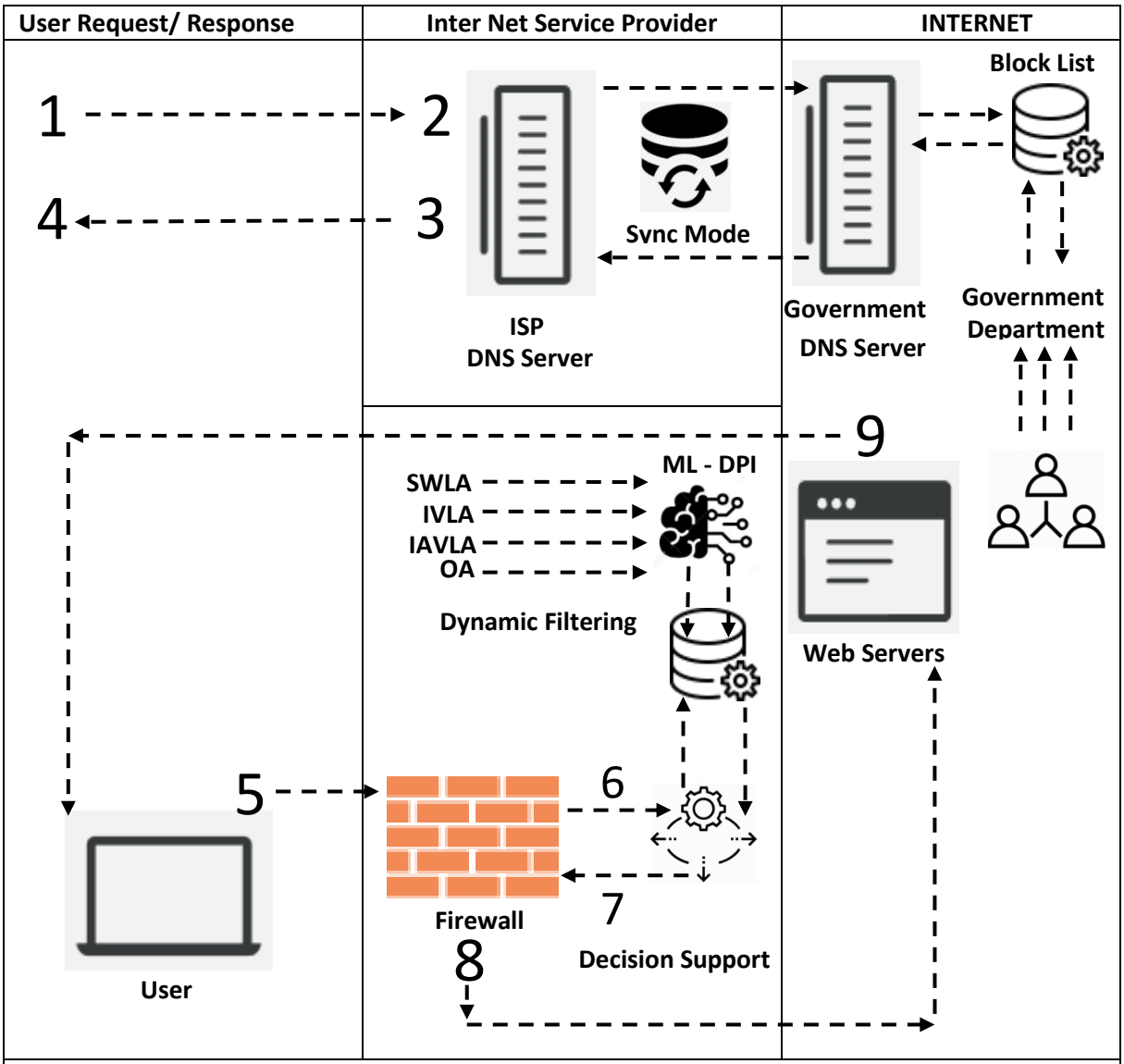
DISPLAY BLOCK PAGE

ELSE

FORWARD USER REQUEST TO WEB SERVER

Objective No. 5: A functional model in regard to filter and control unsolicited web content in India.

Functional Model



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6.2 Limitations

The study conducted only in consideration of the websites related only. No application-level blocking and filtering parameters have been taken in to account for testing purposes. The used approach of testing is limited to the HTTP Filtering, DNS Tampering (DNS Poising, DNS Injection), and TCP IP Blocking techniques parameter.

6.3 Delimitations

The scope of analysis is restricted to 843 websites, which are blocked by the Government of India in compliance with the High Court order issued on September 27, 2018. The order instructed internet service providers to disable those websites which hold child pornographic content. The testing parameter checked with Reliance Jio and the NKN network.

6.4 Suggestion for Further Researcher

The present study can be directly extended to the other counties. In this study, tests have been conducted in the Indian geographic context only. The study can be reached in several other directions (web and app-level) also like filtering and blocking possibilities at a different level of web pages, social media, mobile apps, streaming apps, photo-sharing applications, social network platforms, video-sharing applications, live video streaming apps, text and voice messaging applications.

APPENDIX

Dataset (A)

List of Total (815) Hosts Considered as Known Population

1	http://theporndude.com/	409	http://hotnudematures.com/
2	http://indianporntube.xxx/	410	http://bigfreemature.com/
3	http://sexsex.hu/	411	http://milfionaire.com/
4	http://hot-dates.info/	412	http://wifezilla.com/
5	http://en.cam4.com.br/	413	http://freematurevideo.net/
6	http://videos.petardas.com/	414	http://maturenakedsluts.com/
7	http://es.porn.com/	415	http://tgpmaturewoman.com/
8	http://jav-porn.net/	416	http://mature-women-tube.org/
9	http://callboyindia.com/	417	http://matureal.com/
10	http://pornfromczech.com/	418	http://bestmilftube.com/
11	http://mypornbookmarks.com/	419	http://dianapost.com/
12	http://bomnporn.com/	420	http://hotfreemilfs.com/
13	http://africansexvideos.net/	421	http://momsnightjob.com/
14	http://kirtu.com/	422	http://thexmilf.com/
15	http://eroticperfection.com/	423	http://numaturewomen.com/
16	http://hqlinks.net/	424	http://chubbygalls.com/
17	http://dslady.com/	425	http://silkymoms.com/
18	http://gaypornium.com/	426	http://riomoms.com/
19	http://en.cam4.co/	427	http://booloo.com/
20	http://indiansex4u.com/	428	http://fuckmaturewhore.com/
21	http://teengayporntube.com/	429	http://hqmaturemovs.com/
22	http://sexxxxi.com/	430	http://sharedxpics.com/
23	http://3rat.com/	431	http://bestmatureclips.com/
24	http://4hen.com/	432	http://viewmature.com/
25	http://luboeporno.com/	433	http://milfgals.net/
26	http://shemale.asia/	434	http://matureintros.com/
27	http://thefreecamsecret.com/	435	http://maturecool.com/
28	http://fapto.xxx/	436	http://matureasspics.com/
29	http://gracefulnudes.com/	437	http://milfmomspics.com/
30	http://cam4.in/	438	http://matureporpics.com/

31 http://cullosgratis.com.ve/
32 http://bananabunny.com/
33 http://legalporno.com/
34 http://desimurga.com/
35 http://pinkythekinky.com/
36 http://gracefulnudes.com/
37 http://ixxx.com/
38 http://indlansex.net/
39 http://momsteachsex.com/
40 http://analsexstars.com/
41 http://pinkworld.com/
42 http://89.com/
43 http://indianpornovid.com/
44 http://playboy.com/
45 http://locasporfollar.com/
46 http://perfectgirls.net/
47 http://hairy.com/
48 http://fuckcuck.com/
49 http://ixxx.com.es/
50 http://darering.com/
51 http://drtuber.com/
52 http://epicporntube.com/
53 http://hindisex.com/
54 http://milfmovs.com/
55 http://sexocean.com/
56 http://pornorc.net/
57 http://thefreecamsecret.com/
58 http://teenpornxxx.net/
59 http://livjasmin.com/
60 http://naughty.com/
61 http://perucaseras.com/
62 http://xxx.com/
63 http://x-ho.com/
64 http://cliphunter.com/
65 http://watchmygf.com/
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379	http://eromatures.net/	787	http://hindi-sex.net/
380	http://nakedbustytits.com/	788	http://nonvegjokes.com/
381	http://watchersweb.com/	789	http://myhotsite.net/
382	http://olderwomenarchive.com/	790	http://hindiold.com/
383	http://xxxmaturepost.com/	791	http://jlobster.com/
384	http://needmilf.com/	792	http://bollywood-sex.net/
385	http://horny-matures.net/	793	http://desikahani.net/
386	http://grandmabesttube.com/	794	http://desitales.com/
387	http://lovely-mature.net/	795	http://pof.com/
388	http://wild-matures.com/	796	http://katestube.com/
389	http://mature30plus.com/	797	http://xxxsummer.net/
390	http://action36.com/	798	http://desikamasutra.com/
391	http://myfreemoms.com/	799	http://nuvid.com/
392	http://stiflersmilfs.com/	800	http://indiankahani.com/
393	http://pornovideo.italy.com/	801	http://private.com/
394	http://matureamour.com/	802	http://eternaldesire.com/
395	http://fantasticwomans.com/	803	http://allindiansex.com/
396	http://lenawethole.com/	804	http://fucking8.com/
397	http://boobymilf.com/	805	http://heganporn.com/
398	http://girlmature.com/	806	http://indiansgoanal.org/
399	http://bettermilfs.com/	807	http://slutload.com/
400	http://themomsfucking.net/	808	http://desipapa.com/
401	http://mature-women-tube.net/	809	http://oigh.info/
402	http://lustfuloldies.com/	810	http://befuck.com/
403	http://babesclub.net/	811	http://milfsaffair.com/
404	http://milfatwork.net/	812	http://mommyxxxmovies.com/
405	http://oldsexybabes.net/	813	http://matureladies.com/
406	http://nudematurespics.com/	814	http://xxxolders.com/
407	http://cocomilfs.com/	815	http://freeones.ch/
408	http://sexymilfpussy.com/		

Dataset (B)

List of 144 Hosts Selected through Simple Random Sampling for 200 Error Codes

S. No. URL Response Time

1	http://3animalsextube.com/	0.000361248
2	http://yehfun.com/	0.001763839
3	http://lenawethole.com/	0.002221424
4	http://grandmammapics.com/	0.002932147
5	http://riomoms.com/	0.005340938
6	http://smutty.com/	0.005459517
7	http://live.sugarbbw.com/	0.006958428
8	http://cleoteener.com/	0.007435106
9	http://insext.net/	0.014049677
10	http://pornmaturewomen.com/	0.014113661
11	http://maturesexy.us/	0.016228422
12	http://khu18.biz/	0.017818684
13	http://mature-beach.com/	0.018080206
14	http://playboy.com/	0.018912175
15	http://sexyhotmilfs.com/	0.022365927
16	http://h33t.to/	0.025154013
17	http://boytikol.com/	0.035937881
18	http://thehotpics.com/	0.039570511
19	http://hot-naked-milfs.com/	0.040470587
20	http://bestmilftube.com/	0.041318914
21	http://hot-dates.info/	0.044223681
22	http://7feel.net/	0.04702496
23	http://riotits.net/	0.047327632
24	http://bigbuttmature.com/	0.05116893
25	http://shemale.asia/	0.052075045
26	http://juicygranny.com/	0.052450123
27	http://gorgeousladies.com/	0.053046929
28	http://kirtu.com/	0.053348963
29	http://hollywoodjizz.com/	0.059716168
30	http://matures-photos.com/	0.059937952
31	http://mypornbookmarks.com/	0.064390735
32	http://allindiansexstories.com/	0.064553571
33	http://thefreecamsecret.com/	0.06615052
34	http://gramateurs.com/	0.074542667
35	http://ladymom.com/	0.07710593

36	http://wegret.com/	0.077963501
37	http://amapics.net/	0.079099318
38	http://xxxvideo.com/	0.079699115
39	http://truthordarepics.com/	0.082345411
40	http://2gayboys.com/	0.085998683
41	http://watchmygf.com/	0.088436855
42	http://hotmomspics.com/	0.089337054
43	http://nudedares.tumblr.com/	0.08942667
44	http://mamitatube.com/	0.090172718
45	http://oldhotmoms.com/	0.095133044
46	http://uniquesexymoms.com/	0.095438621
47	http://theporndude.com/	0.100494219
48	http://pornnakedgirls.com/	0.100877341
49	http://multimature.com/	0.101555659
50	http://sex3.com/	0.103007178
51	http://inlovewithboobs.com/	0.103912892
52	http://cuckinohio.tumblr.com/	0.104263909
53	http://beautyandthebeard1.tumblr.com/	0.104890755
54	http://matureshine.com/	0.105133877
55	http://pamelapost.com/	0.109739157
56	http://dorceltv.xn.pl/	0.109993519
57	http://womenmaturepics.com/	0.111664146
58	http://mulligansmilfs.com/	0.118048369
59	http://savitabhabhi.mobi/	0.122294744
60	http://momsinporn.net/	0.124202646
61	http://tgpmaturewoman.com/	0.125595392
62	http://oldsexybabes.net/	0.12628926
63	http://momshere.com/	0.127566464
64	http://matureladiespics.com/	0.128186013
65	http://nudeboobshotpics.com/	0.130281187
66	http://webcam.com/	0.131484813
67	http://iloveindiansex.com/	0.1374973
68	http://queenofmature.com/	0.138458178
69	http://wetmaturewomen.com/	0.143510115
70	http://milfmomspics.com/	0.16055026

71	http://amaclips.com/	0.161505147
72	http://teen18ass.com/	0.162568925
73	http://comicmasala.com/	0.164401459
74	http://freesex.com/	0.165651191
75	http://drtuber.com/	0.167194085
76	http://horny-olders.com/	0.168010173
77	http://bigfreemature.com/	0.16986616
78	http://momstaboo.com/	0.169903091
79	http://motherless.com/	0.169943859
80	http://matureguide.com/	0.170425194
81	http://myexmilf.com/	0.17065674
82	http://mature-women-tube.org/	0.171546047
83	http://hdrolet.com/	0.171962022
84	http://bestmatureclips.com/	0.172314018
85	http://maturebabesporno.com/	0.173391199
86	http://fsiblog.com/	0.176732368
87	http://wetmaturewhores.com/	0.178879879
88	http://rude.com/	0.191917485
89	http://sexocean.com/	0.193969026
90	http://thefreecamsecret.com/	0.195433347
91	http://video-one.com/	0.195996594
92	http://pornmdk.com/	0.199547059
93	http://newsfilter.org/	0.200192182
94	http://tinysolo.com/	0.202758822
95	http://chubbygalls.com/	0.204541529
96	http://indiansex4u.com/	0.207102574
97	http://beeg.com/	0.207223739
98	http://thehotpics.com/	0.207799146
99	http://nude-oldies.com/	0.208158396
100	http://home-madness.com/	0.212327204
101	http://fuck-milf.com/	0.212804421
102	http://30plusgirls.com/	0.214028667
103	http://youngmint.com/	0.220159313
104	http://es.bongacams.com/	0.223664587
105	http://stiflersmoms.com/	0.224830755

106	http://matureamour.com/	0.226791451
107	http://eroticperfection.com/	0.228330166
108	http://idealmilf.com/	0.229325861
109	http://booloo.com/	0.234196577
110	http://eatyouout.tumblr.com/	0.245319536
111	http://teengayporntube.com/	0.245584632
112	http://classic-moms.com/	0.245822184
113	http://cocomilfs.com/	0.247493691
114	http://milf-fucking.net/	0.250523585
115	http://kickass.co/	0.250686141
116	http://riomature.com/	0.252795766
117	http://secretarypics.com/	0.253091235
118	http://matureoracle.com/	0.258597389
119	http://pornofemmeblack.com/	0.261280015
120	http://woodstockreborn.tumblr.com/	0.261552105
121	http://boobymilf.com/	0.261610421
122	http://axnxxx.org/	0.263135305
123	http://godao.com/	0.263930135
124	http://milfgals.net/	0.264257914
125	http://pinkteenpics.com/	0.264578326
126	http://riomoms.com/	0.270511101
127	http://sextubelinks.com/	0.271777567
128	http://stiflersmilfs.com/	0.272107755
129	http://jizzporntube.com/	0.273527917
130	http://x-ho.com/	0.274659807
131	http://sexymaturepussies.com/	0.277846404
132	http://mom50.com/	0.302478522
133	http://momhandjob.com/	0.305568364
134	http://oldpoon.com/	0.307672475
135	http://xbabe.com/	0.311748117
136	http://matureclits.net/	0.314771352
137	http://mega-teen.com/	0.314879231
138	http://posing-matures.com/	0.318598041
139	http://xhot.sextgem.com/	0.319080842
140	http://sexyteensphotos.com/	0.320024245

141	http://matureclithunter.com/	0.325844303
142	http://xxxbunker.com/	0.328913749
143	http://free-porn-pics.net/	0.333314408
144	http://elderly-women.com/	0.333970627

Dataset (C)

List of 60 Hosts Selected through Simple Random Sampling for 301 Error Codes

S. No.	URL	Response Time
1	http://azgals.com/	0.00413422
2	http://hqoldies.com/	0.004545489
3	http://dagay.com/	0.009202058
4	http://premium.gays.com/	0.013064506
5	http://older-beauty.com/	0.019481869
6	http://porndig.com/	0.023670141
7	http://collegehumor.com/	0.027220661
8	http://slutload.com/	0.033068573
9	http://cumlouder.com/	0.035614655
10	http://gggay.com/	0.041679244
11	http://xxx.xxx/	0.048772664
12	http://tukif.com/	0.052346999
13	http://ixxx.ws/	0.068659291
14	http://filthymamas.com/	0.068733354
15	http://theofficiallouisejenson.com/	0.093210515
16	http://empflix.com/	0.115035265
17	http://penguinvids.com/	0.116084211
18	http://indiansexstories.net/	0.118878238
19	http://cliphunter.com/	0.119762823
20	http://pornorc.net/	0.125098936
21	http://xxxkinky.com/	0.133497061
22	http://cholotube.com/	0.135591475
23	http://sexxxdoll.com/	0.135909014
24	http://bigboobsalert.com/	0.136621385
25	http://xxx.adulttube.com/	0.138010787
26	http://pinkcupid.com/	0.143889282
27	http://indienne-sexy.com/	0.149344156

28	http://pandamovies.com/	0.156900817
29	http://imagefap.com/	0.157929696
30	http://asiatique-femme.com/	0.158278281
31	http://sexy-links.net/	0.170668197
32	http://liberteenage.com/	0.172606767
33	http://spankwire.com/	0.178448931
34	http://rk.com/	0.196495213
35	http://nudematurewomenphotos.com/	0.198808408
36	http://myfreecams.com/	0.216780832
37	http://tubestack.com/	0.217318215
38	http://eros.com/	0.217401744
39	http://brazzersnetwork.com/	0.217453978
40	http://redtuve.com/	0.22708292
41	http://find-best-videos.com/	0.230931956
42	http://befuck.com/	0.232894675
43	http://madmamas.com/	0.233737779
44	http://shemales.com/	0.244824665
45	http://pinsex.com/	0.247682154
46	http://clit7.com/	0.247860128
47	http://hotnakedoldies.com/	0.248024838
48	http://olderkiss.com/	0.260667194
49	http://indiangilma.com/	0.26154391
50	http://barstoolsports.com/	0.266065517
51	http://pornhub.com/	0.273269006
52	http://cindymovies.com/	0.274257618
53	http://mature.nl/	0.290020875
54	http://breeolson.com/	0.305849818
55	http://fakku.net/	0.308869261
56	http://poringa.net/	0.310189451
57	http://muyzorras.com/	0.311239653
58	http://ledauphine.com/	0.324836113
59	http://roundandbrown.com/	0.331503205
60	http://videosxxxputas.xxx/	0.350588191

Dataset (D)

List of 45 Hosts Selected through Simple Random Sampling for 0/ Blank Error Codes

S. No.	URL	Response Time
1	http://porno-marocaine.com/	0.010334578
2	http://pornotantique.com/	0.011711055
3	http://videosfilleschaudes.com/	0.01249191
4	http://hornybook.com/	0.019313217
5	http://needmilf.com/	0.02148685
6	http://les-groses.net/	0.03371637
7	http://cam4.in/	0.041456402
8	http://gentlemoms.com/	0.047792515
9	http://beurettehot.net/	0.04876022
10	http://7dog.com/	0.053392172
11	http://peliculaspornogratisxxx.com/	0.07899894
12	http://lechecallente.com/	0.089320826
13	http://tubeduporno.com/	0.095840535
14	http://pornocolumbia.co/	0.101632043
15	http://film-xxx-black.com/	0.112483044
16	http://myhdshop.com/	0.115384538
17	http://fotomujeres.pibones.com/	0.132646973
18	http://bigboty4free.com/	0.144359354
19	http://sexonapria.org/	0.151413187
20	http://anatarvasnavideos.com/	0.166777846
21	http://teemns-pic.com/	0.171999184
22	http://buzzwok.com/	0.180479057
23	http://grannyxxx.co.uk/	0.184261852
24	http://numaturewomen.com/	0.186235408
25	http://hotamateurclip.com/	0.196242343
26	http://mature-galleries.org/	0.197018891
27	http://sexbotbonnasse.com/	0.19966799
28	http://videos-sexe.1touffe.com/	0.203385287
29	http://sexcoachapp.com/	0.211358247

30	http://bomnporn.com/	0.219040278
31	http://sexe-evbony.com/	0.229066487
32	http://fille-nue-video.com/	0.231289195
33	http://myfreepornvideos.net/	0.234874603
34	http://xxxsummer.net/	0.237960869
35	http://hard.pornoxxl.org/	0.24046452
36	http://gobeurettes.com/	0.245438129
37	http://horny-matures.net/	0.249287809
38	http://goodgrannypics.com/	0.254995314
39	http://fapto.xxx/	0.264408384
40	http://freematurevideo.net/	0.265120358
41	http://videosanalesx.com/	0.296097021
42	http://marocainenue.com/	0.301524776
43	http://sexe2asiatique.com/	0.309186754
44	http://omegaporno.com/	0.311849385
45	http://sex.pornoxxl.org/	0.324317335

Dataset (E)

List of 14 Hosts Selected through Simple Random Sampling for Error Code 302

S No.	URL	Response Time
1	http://xixx.com/	0.06353607
2	http://pornstarhangout.com/	0.078999055
3	http://xxxmomclips.com/	0.084626982
4	http://shitbrix.com/	0.085224093
5	http://agedcunts.net/	0.089093816
6	http://largepontube.com/	0.154610763
7	http://desikamasutra.com/	0.161248759
8	http://xvideosnacional.com/	0.178103874
9	http://mc-nudes.com/	0.194839893
10	http://bigtitsnaked.com/	0.249584928
11	http://yourlustgirlfriends.com/	0.258852867
12	http://maturehere.com/	0.273263913
13	http://porn.com/	0.303672052
14	http://voyeursport.com/	0.344095134

Dataset (F)

List of 701 Hosts for Successful Lookup Response

S. No.	Host Name	Record Type	Status
1	indlansex.net	A	Resolved
2	3rat.com	A	Resolved
3	4hen.com	A	Resolved
4	africansexvideos.net	A	Resolved
5	bananabunny.com	A	Resolved
6	cutepornvideos.com	A	Resolved
7	desimurga.com	A	Resolved
8	desisexclips.com	A	Resolved
9	dslady.com	A	Resolved
10	eroticperfection.com	A	Resolved
11	es.porn.com	A	Resolved
12	gaypornium.com	A	Resolved
13	gracefulnudes.com	A	Resolved
14	hot-dates.info	A	Resolved
15	hqlinks.net	A	Resolved
16	indiansex4u.com	A	Resolved
17	jav-porn.net	A	Resolved
18	kirtu.com	A	Resolved
19	legalporno.com	A	Resolved
20	luboeporno.com	A	Resolved
21	mypornbookmarks.com	A	Resolved
22	pinkythekinky.com	A	Resolved
23	pornfromczech.com	A	Resolved
24	sexsex.hu	A	Resolved
25	sexxxxi.com	A	Resolved
26	shemale.asia	A	Resolved
27	teengayporntube.com	A	Resolved
28	thefreecamsecret.com	A	Resolved
29	theporndude.com	A	Resolved
30	momsteachsex.com	A	Resolved
31	videos.petardas.com	A	Resolved
32	www.xvideos.com	A	Resolved

33	www.89.com	A	Resolved
34	www.alohatube.com	A	Resolved
35	www.analsexstars.com	A	Resolved
36	www.babosas.com	A	Resolved
37	www.brazzers.com	A	Resolved
38	en.cam4.co	A	Resolved
39	en.cam4.com.br	A	Resolved
40	www.cholotube.com	A	Resolved
41	www.cliphunter.com	A	Resolved
42	www.cumlouder.com	A	Resolved
43	www.darering.com	A	Resolved
44	www.drtuber.com	A	Resolved
45	www.epicporntube.com	A	Resolved
46	www.eporner.com	A	Resolved
47	www.flirt4free.com	A	Resolved
48	www.freeones.com	A	Resolved
49	www.freshporn.info	A	Resolved
50	www.fuckcuck.com	A	Resolved
51	www.gracefulnudes.com	A	Resolved
52	www.gayboystube.com	A	Resolved
53	www.fuq.com	A	Resolved
54	www.hairy.com	A	Resolved
55	www.hindisex.com	A	Resolved
56	www.iknowthatgirl.com	A	Resolved
57	www.indianpornovid.com	A	Resolved
58	www.indianpornvideos.com	A	Resolved
59	www.ixxx-tube.com	A	Resolved
60	www.ixxx.com	A	Resolved
61	www.ixxx.ws	A	Resolved
62	www.jizzhut.com	A	Resolved
63	www.labatidora.net	A	Resolved
64	www.leche69.com	A	Resolved
65	www.livjasmin.com	A	Resolved
66	www.locasporfollar.com	A	Resolved
67	www.lushstories.com	A	Resolved

68	www.mc-nudes.com	A	Resolved
69	www.milfmovs.com	A	Resolved
70	www.myfreecams.com	A	Resolved
71	www.naughty.com	A	Resolved
72	www.penguinvids.com	A	Resolved
73	www.perfectgirls.net	A	Resolved
74	www.perucaseras.com	A	Resolved
75	www.pinkworld.com	A	Resolved
76	www.playboy.com	A	Resolved
77	www.playvid.com	A	Resolved
78	www.pornhub.com	A	Resolved
79	www.porno.com	A	Resolved
80	www.pornorc.net	A	Resolved
81	www.porntube.com	A	Resolved
82	www.puritanas.com	A	Resolved
83	www.redtube.com	A	Resolved
84	www.rk.com	A	Resolved
85	www.roundandbrown.com	A	Resolved
86	www.serviporno.com	A	Resolved
87	www.sexocean.com	A	Resolved
88	www.teenpornxxx.net	A	Resolved
89	www.thefreecamsecret.com	A	Resolved
90	www.tnaflix.com	A	Resolved
91	www.truthordarepics.com	A	Resolved
92	www.tube8.com	A	Resolved
93	www.tubegalore.com	A	Resolved
94	www.watchmygf.com	A	Resolved
95	www.x-ho.com	A	Resolved
96	www.xixx.com	A	Resolved
97	www.xnxx.com	A	Resolved
98	www.xtube.com	A	Resolved
99	www.xvideosnacional.com	A	Resolved
100	www.xxx.com	A	Resolved
101	www.youjizz.com	A	Resolved
102	www.youporn.com	A	Resolved

103	xhamster.com	A	Resolved
104	xhot.sextgem.com	A	Resolved
105	xxx.com	A	Resolved
106	www.jeux-flash-sexy.com	A	Resolved
107	www.purebbwtube.com	A	Resolved
108	www.babes.com	A	Resolved
109	www.rubber-kingdom.com	A	Resolved
110	savitabhabhi.mobi	A	Resolved
111	pinkvisualtgp.com	A	Resolved
112	www.antarvasna.com	A	Resolved
113	www.flirthookup.com	A	Resolved
114	www.cerdas.com	A	Resolved
115	es.chaturbate.com	A	Resolved
116	www.youngpornvideos.com	A	Resolved
117	www.nudevista.com	A	Resolved
118	2gayboys.com	A	Resolved
119	pornxxxtubes.com	A	Resolved
120	www.ledauphine.com	A	Resolved
121	freex.mobi	A	Resolved
122	www.megavideoporno.org	A	Resolved
123	bdenjoymore.blogspot.com	A	Resolved
124	www.petardas.com	A	Resolved
125	www.toroporno.com	A	Resolved
126	conejox.com	A	Resolved
127	www.sambaporno.com	A	Resolved
128	www.indienne-sexy.com	A	Resolved
129	www.porn.com	A	Resolved
130	xxxonxxx.com	A	Resolved
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626	www.pinksofa.com	A	Resolved
627	www.pinkcupid.com	A	Resolved

628	www.onlyporngif.com	A	Resolved
629	sexyono.com	A	Resolved
630	www.shitbrix.com	A	Resolved
631	motherless.com	A	Resolved
632	thehotpics.com	A	Resolved
633	www.joncjg.blogspot.in	A	Resolved
634	fr-nostradamus.com	A	Resolved
635	japanesexxxtube.com	A	Resolved
636	www.kilopics.com	A	Resolved
637	www.find-best-lingerie.com	A	Resolved
638	www.dustyporn.com	A	Resolved
639	cleoteener.com	A	Resolved
640	teen18ass.com	A	Resolved
641	www.eternaldesire.com	A	Resolved
642	www.sexyteensphotos.com	A	Resolved
643	www.bubblebuttpics.com	A	Resolved
644	allofteens.com	A	Resolved
645	www.tinysolo.com	A	Resolved
646	www.mynakedteens.com	A	Resolved
647	youngmint.com	A	Resolved
648	www.yourlustgirlfriends.com	A	Resolved
649	www.youngxxxpics.com	A	Resolved
650	www.pinkteenpics.com	A	Resolved
651	www.clit7.com	A	Resolved
652	www.find-best-videos.com	A	Resolved
653	www.freekiloclips.com	A	Resolved
654	www.nudeartstars.com	A	Resolved
655	www.freeporndr.com	A	Resolved
656	www.disco-girls.com	A	Resolved
657	www.lewd-girls.com	A	Resolved
658	mega-teen.com	A	Resolved
659	www.heganporn.com	A	Resolved
660	rude.com	A	Resolved
661	tour.fuckmyindiangf.com	A	Resolved
662	desindian.sextgem.com	A	Resolved

663	www.iscindia.org	A	Resolved
664	www.tubegogo.com	A	Resolved
665	in.spankbang.com	A	Resolved
666	www.yehfun.com	A	Resolved
667	www.indiankahani.com	A	Resolved
668	www.pornmdk.com	A	Resolved
669	www.tubestack.com	A	Resolved
670	www.desikahani.net	A	Resolved
671	xesi.mobi	A	Resolved
672	www.desitales.com	A	Resolved
673	www.allindiansex.com	A	Resolved
674	www.tubexclips.com	A	Resolved
675	www.comicmasala.com	A	Resolved
676	www.slutload.com	A	Resolved
677	www.befuck.com	A	Resolved
678	allindiansexstories.com	A	Resolved
679	cinedunia.com	A	Resolved
680	www.bollywood-sex.net	A	Resolved
681	www.funjadu.com	A	Resolved
682	iloveindiansex.com	A	Resolved
683	m.chudaimaza.com	A	Resolved
684	www.adultphonechatlines.co.uk	A	Resolved
685	fsiblog.com	A	Resolved
686	www.fucking8.com	A	Resolved
687	www.cloaktube.com	A	Resolved
688	indianhotjokes.blogspot.in	A	Resolved
689	wegret.com	A	Resolved
690	www.desipapa.com	A	Resolved
691	alizjokes.blogspot.in	A	Resolved
692	jlobster.com	A	Resolved
693	www.desikamasutra.com	A	Resolved
694	www.myhotsite.net	A	Resolved
695	hindi-sex.net	A	Resolved
696	www.bullporn.com	A	Resolved
697	oigh.info	A	Resolved

698	jizzporntube.com	A	Resolved
699	nonvegjokes.com	A	Resolved
700	www.eeltube.com	A	Resolved
701	hindiold.com	A	Resolved

Dataset (G)

List of 142 Websites for Error Response 9003, 9002

S. No.	Host Name	Record Type	Status
1	indianporntube.xxx	A	Error 9003:
2	www.bomnporn.com	A	Error 9003:
3	www.callboyindia.com	A	Error 9003:
4	www.cam4.in	A	Error 9002:
5	www.cullosgratis.com.ve	A	Error 9003:
6	www.fapto.xxx	A	Error 9003:
7	www.ixxx.com.es	A	Error 9003:
8	www.fotomujeres.pibones.com	A	Error 9003:
9	www.hot-gifz.com	A	Error 9003:
10	www.lechecallente.com	A	Error 9003:
11	www.parejasfollando.es	A	Error 9003:
12	www.pornochaud.com	A	Error 9003:
13	www.gokabyle.com	A	Error 9003:
14	www.voyeurpipi.com	A	Error 9003:
15	porn.mangassex.com	A	Error 9003:
16	goulnes.pornoxxxi.net	A	Error 9003:
17	videos-x.xpornogays.com	A	Error 9003:
18	www.arabebaise.com	A	Error 9003:
19	www.ohasiatique.com	A	Error 9003:
20	www.marocainenue.com	A	Error 9003:
21	www.fille-nue-video.com	A	Error 9003:
22	bootlus.com	A	Error 9003:
23	videosfilleschaudes.com	A	Error 9003:
24	femmesmuresx.net	A	Error 9003:
25	www.xnxxgifs.com	A	Error 9003:
26	www.gaygautemela.com	A	Error 9003:
27	saoulbafjojo.com	A	Error 9003:

28	pornofemmeblack.com	A	Error 9003:
29	sexonapria.org	A	Error 9003:
30	www.beurettehot.net	A	Error 9003:
31	www.lesbiennesxxx.com	A	Error 9003:
32	www.videos-porno-chaudes.com	A	Error 9003:
33	www.xgouines.com	A	Error 9003:
34	www.couleurivoire.com	A	Error 9003:
35	moncotube.net	A	Error 9003:
36	www.sexcoachapp.com	A	Error 9003:
37	www.femdomecpire.com	A	Error 9003:
38	www.guide-asie.com	A	Error 9003:
39	www.beauxcul.com	A	Error 9003:
40	www.tubeduporno.com	A	Error 9003:
41	videos-sexe.1touffe.com	A	Error 9003:
42	video-porno.videurdecouilles.com	A	Error 9003:
43	xxi.onxxille.com	A	Error 9003:
44	www.masalopeblack.com	A	Error 9003:
45	www.porno-marocaine.com	A	Error 9003:
46	www.69rueporno.com	A	Error 9002:
47	www.arabe-sexy.com	A	Error 9003:
48	www.film-porno-black.com	A	Error 9003:
49	www.sexe-evbony.com	A	Error 9003:
50	cochonnevideosx.com	A	Error 9003:
51	chaudassedusexe.com	A	Error 9003:
52	videosanalesx.com	A	Error 9003:
53	www.pornotantique.com	A	Error 9002:
54	video-sex.femmesx.net	A	Error 9003:
55	www.boutique-sexy.ch	A	Error 9003:
56	www.salope-marocaine.com	A	Error 9003:
57	www.pornocolumbia.co	A	Error 9003:
58	www.jeunette18.com	A	Error 9003:
59	www.redtuve.com	A	Error 9003:
60	www.les-groses.net	A	Error 9003:
61	www.film-xxx-black.com	A	Error 9003:
62	www.tendance-lesbienne.com	A	Error 9003:

63	7dog.com	A	Error 9002:
64	videos-porno.x18xxx.com	A	Error 9003:
65	blogfalconstudios.com	A	Error 9003:
66	www.omegaporno.com	A	Error 9003:
67	www.nautilix.com	A	Error 9003:
68	www.ovideox.com	A	Error 9003:
69	hard.pornoxxl.org	A	Error 9003:
70	xxl.sexgratuits.com	A	Error 9003:
71	www.pornosfilms.com	A	Error 9003:
72	www.hornybook.com	A	Error 9002:
73	pornhubfillesalope.com	A	Error 9003:
74	girlygifporn.com	A	Error 9003:
75	sexbotbonnasse.com	A	Error 9003:
76	salope.1japonsex.com	A	Error 9003:
77	freshmatureporn.com	A	Error 9003:
78	matures-photos.com	A	Error 9003:
79	www.mature-galleries.org	A	Error 9003:
80	grannyxxx.co.uk	A	Error 9003:
81	bitefaim.com	A	Error 9003:
82	www.zmilfs.com	A	Error 9002:
83	horny-matures.net	A	Error 9003:
84	grandmabesttube.com	A	Error 9003:
85	needmilf.com	A	Error 9003:
86	lovely-mature.net	A	Error 9003:
87	www.pornovideo.italy.com	A	Error 9003:
88	www.freematurevideo.net	A	Error 9003:
89	www.xxxmomclips.com	A	Error 9003:
90	www.numaturewomen.com	A	Error 9003:
91	www.cleomture.com	A	Error 9003:
92	milf-fucking.net	A	Error 9003:
93	www.mygranny.pics	A	Error 9003:
94	www.eroticteens.pw	A	Error 9003:
95	matureholes.net	A	Error 9003:
96	hardsexyyoupornhub.com	A	Error 9003:
97	www.mturemomsporn.com	A	Error 9003:

98	www.petiteporn.pw	A	Error 9003:
99	www.wethairywats.com	A	Error 9003:
100	www.maturedally.net	A	Error 9003:
101	www.hotchicks.sexy	A	Error 9003:
102	www.milfsection.met	A	Error 9003:
103	bestmilfsporn.com	A	Error 9003:
104	www.maturebrotherthumbs.com	A	Error 9003:
105	www.nakedoldbabes.com	A	Error 9002:
106	wifenaked.net	A	Error 9003:
107	www.maturexxxclipz.com	A	Error 9003:
108	www.amateur-libertins.net	A	Error 9003:
109	eroticplace.net	A	Error 9003:
110	amapics.net	A	Error 9003:
111	www.mommyxxxmovies.com	A	Error 9003:
112	www.teenpussy.pw	A	Error 9003:
113	www.immaturewomen.com	A	Error 9003:
114	www.bigboty4free.com	A	Error 9003:
115	maturebabesporno.com	A	Error 9003:
116	bigtitsporn.me	A	Error 9003:
117	sex.pornoxxl.org	A	Error 9003:
118	www.bizzzporno.com	A	Error 9003:
119	teemns-pic.com	A	Error 9003:
120	video-porno.1lecheuse.com	A	Error 9003:
121	www.gobeurettes.com	A	Error 9003:
122	hotamateurclip.com	A	Error 9003:
123	www.esseporn.com	A	Error 9003:
124	www.myfreepornvideos.net	A	Error 9003:
125	video.freex.mobl	A	Error 9003:
126	www.bravioteens.com	A	Error 9003:
127	www.10pointz.com	A	Error 9003:
128	www.pornokutusu.com	A	Error 9003:
129	www.pornoforo.com	A	Error 9003:
130	www.daultpornvideox.com	A	Error 9003:
131	ww.lastsexe.com	A	Error 9003:
132	masturbationaddicton.net	A	Error 9003:

133	teenpornjoy.com	A	Error 9003:
134	www.superdiosas.com	A	Error 9002:
135	www.pornstarnirvna.com	A	Error 9003:
136	www.llveleak.com	A	Error 9003:
137	www.anatarvasnavideos.com	A	Error 9003:
138	boyddl.com	A	Error 9003:
139	www.porn20.org	A	Error 9003:
140	www.hyat.mobi	A	Error 9003:
141	www.indiansgoanal.org	A	Error 9002:
142	www.haporntube.com	A	Error 9003:

Dataset (H)

List of 100 Host Name Available for Purchase

S. No.	Host Name	Status
1	indianporntube.xxx	Available
2	bomnporn.com	Available
3	callboyindia.com	Available
4	cullosgratis.com.ve	Available
5	fapto.xxx	Available
6	hot-gifz.com	Available
7	lechecallente.com	Available
8	pornochaud.com	Available
9	gokabyle.com	Available
10	voyeurpipi.com	Available
11	arabebaise.com	Available
12	ohasiatique.com	Available
13	marocainenue.com	Available
14	fille-nue-video.com	Available
15	bootlus.com	Available
16	videosfilleschaudes.com	Available
17	femmesmuresx.net	Available
18	gaygautemela.com	Available
19	saoulbafjojo.com	Available
20	pornofemmeblack.com	Available
21	sexonapria.org	Available

22	beurettehot.net	Available
23	videos-porno-chaudes.com	Available
24	xgouines.com	Available
25	couleurivoire.com	Available
26	moncotube.net	Available
27	sexcoachapp.com	Available
28	femdomecpire.com	Available
29	guide-asie.com	Available
30	tubeduporno.com	Available
31	masalopeblack.com	Available
32	porno-marocaine.com	Available
33	arabe-sexy.com	Available
34	film-porno-black.com	Available
35	sexe-evbony.com	Available
36	cochonnevideosx.com	Available
37	chaudassedusexe.com	Available
38	videosanalesx.com	Available
39	boutique-sexy.ch	Available
40	salope-marocaine.com	Available
41	pornocolumbia.co	Available
42	jeunette18.com	Available
43	les-groses.net	Available
44	film-xxx-black.com	Available
45	tendance-lesbienne.com	Available
46	blogfalconstudios.com	Available
47	omegaporno.com	Available
48	nautilix.com	Available
49	ovideox.com	Available
50	pornosfilms.com	Available
51	pornhubfillesalope.com	Available
52	girlygifporn.com	Available
53	sexbotbonnasse.com	Available
54	freshmatureporn.com	Available
55	matures-photos.com	Available
56	mature-galleries.org	Available

57	bitefaim.com	Available
58	horny-matures.net	Available
59	grandmabesttube.com	Available
60	needmilf.com	Available
61	lovely-mature.net	Available
62	freematurevideo.net	Available
63	numaturewomen.com	Available
64	cleomture.com	Available
65	matureholes.net	Available
66	hardsexyyoupornhub.com	Available
67	mturemomsporn.com	Available
68	petiteporn.pw	Available
69	wethairywats.com	Available
70	maturedally.net	Available
71	bestmilfsporn.com	Available
72	maturebrotherthumbs.com	Available
73	wifenaked.net	Available
74	maturexxxclipz.com	Available
75	amateur-libertins.net	Available
76	eroticplace.net	Available
77	amapics.net	Available
78	mommyxxxmovies.com	Available
79	immaturewomen.com	Available
80	bigboty4free.com	Available
81	maturebabesporno.com	Available
82	bizzzporno.com	Available
83	teemns-pic.com	Available
84	gobeurettes.com	Available
85	hotamateurclip.com	Available
86	esseporn.com	Available
87	myfreepornvideos.net	Available
88	bravioteens.com	Available
89	10pointz.com	Available
90	pornokutusu.com	Available
91	pornoforo.com	Available

92	daultpornvideox.com	Available
93	lastsexe.com	Available
94	masturbationaddicton.net	Available
95	pornstarnirvna.com	Available
96	llveleak.com	Available
97	anatarvasnavideos.com	Available
98	boyddl.com	Available
99	porn20.org	Available
100	hyat.mobi	Available

Dataset (I)

List of 19 Host Name Not Available for Purchase

S.No.	Host Name	Status
1	nakedoldbabes.com	Unavailable Domain
2	superdiosas.com	Unavailable Domain
3	cam4.in	Unavailable Domain
4	beauxcul.com	Unavailable Domain
5	lesbiennesxxx.com	Unavailable Domain
6	haporntube.com	Unavailable Domain
7	xnxxgifs.com	Unavailable Domain
8	eroticteens.pw	Unavailable Domain
9	69rueporno.com	Unavailable Domain
10	teenpussy.pw	Unavailable Domain
11	redtuve.com	Unavailable Domain
12	teenpornjoy.com	Unavailable Domain
13	pornotantique.com	Unavailable Domain
14	hornybook.com	Unavailable Domain
15	7dog.com	Unavailable Domain
16	indiansgoanal.org	Unavailable Domain
17	bigtitsporn.me	Unavailable Domain
18	milf-fucking.net	Unavailable Domain
19	zmilfs.com	Unavailable Domain

Dataset (J)

List of 23 Host Name with TLD Records Status

S. No.	Host Name	Status
1	mangassex.com	Available Domain
2	pornoxxxi.net	Available Domain
3	1touffe.com	Available Domain
4	videurdecouilles.com	Available Domain
5	onxxille.com	Available Domain
6	femmesx.net	Available Domain
7	pornoxxl.org	Available Domain
8	sexgratuits.com	Available Domain
9	1japonsex.com	Available Domain
10	xxxmomclips.com	Available Domain
11	pornoxxl.org	Available Domain
12	1lecheuse.com	Available Domain
13	ixxx.com.es	TLD Issue
14	parejasfollando.es	TLD Issue
15	grannyxxx.co.uk	TLD Issue
16	mygranny.pics	TLD Issue
17	hotchicks.sexy	TLD Issue
18	milfsection.met	TLD Issue
19	freex.mobl	TLD Issue
20	pibones.com	Unavailable Domain
21	pornogays.com	Unavailable Domain
22	x18xxx.com	Unavailable Domain
23	italy.com	Unavailable Domain

Dataset (K)

List of 573 Hosts for Successful Response

S. No.	Host Name	IP Address	Ping Status
1	105matures.com	68.169.85.36	Succeeded
2	2gayboys.com	162.244.34.146	Succeeded
3	3animalsextube.com	104.27.139.57	Succeeded
4	3rat.com	216.17.108.71	Succeeded
5	6mature9.com	192.133.138.44	Succeeded

6	9gag.tv	52.217.36.211	Succeeded
7	adultfriendfinder.com	69.165.107.69	Succeeded
8	adultwork.com	84.244.135.70	Succeeded
9	africansexvideos.net	103.224.212.222	Succeeded
10	ahmilf.com	213.227.137.16	Succeeded
11	alansanal.com	74.206.232.234	Succeeded
12	alizjokes.blogspot.in	172.217.166.193	Succeeded
13	allindiansexstories.com	74.206.188.200	Succeeded
14	allofteens.com	104.27.136.14	Succeeded
15	amaclips.com	103.224.212.222	Succeeded
16	amateurmaturewives.com	184.94.149.2	Succeeded
17	arabicdancevideo.blogspot.com	172.217.166.193	Succeeded
18	axnxxx.org	66.37.0.67	Succeeded
19	babesclub.net	64.38.230.2	Succeeded
20	bangbros.com	104.20.132.130	Succeeded
21	bdenjoymore.blogspot.com	172.217.166.193	Succeeded
22	belles-femmes-arabes.blogspot.com	172.217.166.193	Succeeded
23	bestmaturesthumb.com	192.133.138.49	Succeeded
24	bestmaturewomen.com	213.174.130.106	Succeeded
25	bigtitsfree.net	46.229.163.135	Succeeded
26	boobymilf.com	213.174.130.168	Succeeded
27	booloo.com	104.31.84.68	Succeeded
28	broslingerie.com	206.54.175.156	Succeeded
29	chaturbate.com	104.18.90.31	Succeeded
30	cinedunia.com	50.63.202.60	Succeeded
31	cleoteener.com	103.224.182.251	Succeeded
32	coffetube.com	88.214.233.183	Succeeded
33	conejox.com	104.27.160.108	Succeeded
34	cutepornvideos.com	104.171.23.69	Succeeded
35	des-filles-sexy.com	192.99.12.121	Succeeded
36	desimurga.com	104.200.22.130	Succeeded
37	desindian.sextgem.com	54.36.158.42	Succeeded
38	desisexclips.com	104.171.23.70	Succeeded
39	dixvi.com	104.200.22.130	Succeeded
40	dorceltv.xn.pl	54.36.173.120	Succeeded

41	dslady.com	46.229.175.155	Succeeded
42	efukt.com	104.31.84.200	Succeeded
43	en.cam4.co	80.92.65.144	Succeeded
44	eroticperfection.com	46.229.175.155	Succeeded
45	es.bongacams.com	94.199.255.227	Succeeded
46	es.bravotube.net	194.187.99.134	Succeeded
47	es.chaturbate.com	104.18.91.31	Succeeded
48	es.porn.com	67.22.49.255	Succeeded
49	es.xhamster.com	104.18.155.3	Succeeded
50	fantasticwomans.com	88.214.207.162	Succeeded
51	foto-erotica.es	185.53.179.8	Succeeded
52	fr-nostradamus.com	185.53.179.8	Succeeded
53	freex.mobi	104.28.11.125	Succeeded
54	fresh-galleries.com	104.27.158.19	Succeeded
55	fsiblog.com	104.28.23.54	Succeeded
56	fuck-milf.com	69.16.230.42	Succeeded
57	fuckdc.com	184.168.221.59	Succeeded
58	fuckmaturewhore.com	192.133.138.49	Succeeded
59	gaypornium.com	54.39.133.187	Succeeded
60	girlmature.com	46.229.174.95	Succeeded
61	godao.com	188.72.227.112	Succeeded
62	golden-moms.com	213.174.130.168	Succeeded
63	gracefulnudes.com	67.227.226.241	Succeeded
64	gramateurs.com	88.208.20.24	Succeeded
65	h33t.to	185.53.179.6	Succeeded
66	hindi-sex.net	204.11.56.48	Succeeded
67	hindiold.com	23.110.201.61	Succeeded
68	hollywoodjizz.com	192.64.119.94	Succeeded
69	hot-dates.info	103.224.212.222	Succeeded
70	hot-naked-milfs.com	37.48.105.208	Succeeded
71	hotelmatures.com	68.169.85.101	Succeeded
72	hotfreemilfs.com	37.48.105.208	Succeeded
73	hqlinks.net	46.229.175.155	Succeeded
74	hungrymatures.com	68.169.85.99	Succeeded
75	icematures.com	103.224.182.251	Succeeded

76	iloveindiansex.com	50.62.231.1	Succeeded
77	imaturewomen.com	109.206.166.11	Succeeded
78	immoralmatures.com	68.169.85.99	Succeeded
79	in.spankbang.com	104.20.41.98	Succeeded
80	indianhotjokes.blogspot.in	172.217.166.193	Succeeded
81	indlansex.net	35.236.9.200	Succeeded
82	inlovewithboobs.com	64.32.8.70	Succeeded
83	insext.net	151.80.171.138	Succeeded
84	japanesexxxtube.com	104.24.112.30	Succeeded
85	jav-porn.net	104.27.184.172	Succeeded
86	jizzporntube.com	69.16.230.42	Succeeded
87	jlobster.com	185.2.136.199	Succeeded
88	juicy-matures.com	68.169.85.99	Succeeded
89	juicygranny.com	46.229.174.95	Succeeded
90	kellydivine.co	64.188.63.137	Succeeded
91	khu18.biz	35.186.238.101	Succeeded
92	kirtu.com	104.31.91.108	Succeeded
93	largepontube.com	103.224.212.249	Succeeded
94	legalporno.com	185.120.71.25	Succeeded
95	lenawethole.com	88.214.207.162	Succeeded
96	lewd-babes.com	162.251.108.41	Succeeded
97	lookatvintage.com	83.149.118.26	Succeeded
98	m.chudaimaza.com	5.189.133.196	Succeeded
99	mature-beach.com	68.169.85.36	Succeeded
100	mature-women-tube.net	213.174.133.210	Succeeded
101	mature-women-tube.org	23.235.198.21	Succeeded
102	mature30plus.com	144.91.82.159	Succeeded
103	matureclithunter.com	68.169.85.101	Succeeded
104	matureclits.net	68.169.85.103	Succeeded
105	maturedolls.net	103.224.182.251	Succeeded
106	maturegirl.us	46.229.174.95	Succeeded
107	matureinlove.net	188.42.163.228	Succeeded
108	maturelle.com	104.28.31.94	Succeeded
109	maturenags.com	104.171.23.70	Succeeded
110	maturenakedsluts.com	192.133.138.52	Succeeded

111	matureoracle.com	172.241.126.235	Succeeded
112	matureplace.com	54.39.16.2	Succeeded
113	maturesexy.us	46.229.174.95	Succeeded
114	maturesinstockings.com	64.32.8.68	Succeeded
115	maturesort.com	46.166.182.113	Succeeded
116	maturewant.com	192.133.138.45	Succeeded
117	maturewitch.com	72.52.179.175	Succeeded
118	mega-teen.com	174.136.12.111	Succeeded
119	milfatwork.net	162.254.188.72	Succeeded
120	milfera.com	213.227.137.16	Succeeded
121	milffreepictures.com	213.227.137.16	Succeeded
122	milfgals.net	213.174.151.22	Succeeded
123	milfionaire.com	104.28.26.51	Succeeded
124	milfous.com	67.227.226.240	Succeeded
125	milfpornet.com	104.254.83.123	Succeeded
126	milfs30.com	104.26.14.161	Succeeded
127	milfsaffair.com	35.203.113.247	Succeeded
128	mom50.com	192.133.138.51	Succeeded
129	momsinporn.net	188.42.227.17	Succeeded
130	momspics.net	192.133.138.49	Succeeded
131	motherstits.com	213.174.130.168	Succeeded
132	mouparkstreet.blogspot.com	172.217.166.193	Succeeded
133	mulligansmilfs.com	109.206.176.27	Succeeded
134	myexmilf.com	213.227.137.16	Succeeded
135	myfreemoms.com	37.48.105.208	Succeeded
136	newsfilter.org	208.90.155.16	Succeeded
137	nudematuremix.com	162.210.195.123	Succeeded
138	oigh.info	109.201.135.43	Succeeded
139	oldernastybitches.com	192.133.138.46	Succeeded
140	olderwomenarchive.com	104.24.112.172	Succeeded
141	oldsexybabes.net	192.133.138.49	Succeeded
142	oldwomanface.com	103.224.182.251	Succeeded
143	owsmut.com	208.91.197.46	Succeeded
144	pinkvisualtgp.com	159.69.42.212	Succeeded
145	pinkworld.com	64.111.221.56	Succeeded

146	pinkythekinky.com	104.200.22.130	Succeeded
147	playboy.com	13.224.2.125	Succeeded
148	porn720.com	164.132.148.110	Succeeded
149	pornfromczech.com	89.221.213.53	Succeeded
150	pornnakedgirls.com	54.36.56.87	Succeeded
151	porno-wife.com	213.174.132.213	Succeeded
152	pornxxxtubes.com	46.229.175.222	Succeeded
153	queenofmature.com	37.48.105.208	Succeeded
154	realitypassplus.com	98.124.199.107	Succeeded
155	riomature.com	204.155.154.49	Succeeded
156	riomoms.com	204.155.154.49	Succeeded
157	savitabhabhi.mobi	67.227.226.240	Succeeded
158	sex3.com	88.208.55.222	Succeeded
159	sexocean.com	104.254.83.164	Succeeded
160	sexpics.xxx	64.6.108.97	Succeeded
161	sexsex.hu	104.27.186.39	Succeeded
162	sextubelinks.com	46.229.175.223	Succeeded
163	sexxxxi.com	213.174.132.208	Succeeded
164	sexymaturepics.com	109.206.166.7	Succeeded
165	sexymaturepussies.com	162.251.108.26	Succeeded
166	sexymaturethumbs.com	104.27.150.14	Succeeded
167	sexyono.com	151.80.168.133	Succeeded
168	shemale.asia	66.171.238.108	Succeeded
169	shitbrix.com	192.64.119.82	Succeeded
170	silkymoms.com	46.229.175.209	Succeeded
171	smutty.com	109.201.133.249	Succeeded
172	squirtingmastery.com	184.168.221.40	Succeeded
173	stiflersmilfs.com	37.48.105.208	Succeeded
174	stiflersmoms.com	37.48.105.208	Succeeded
175	tgpmaturewoman.com	192.133.138.49	Succeeded
176	thehotpics.com	162.210.195.122	Succeeded
177	themomsfucking.net	192.133.138.49	Succeeded
178	theporndude.com	104.17.34.108	Succeeded
179	tiny-cams.com	5.45.77.42	Succeeded
180	tour.fuckmyindiangf.com	66.115.129.42	Succeeded

181	uniquesexymoms.com	74.117.176.189	Succeeded
182	unshavenpussies.net	74.117.176.189	Succeeded
183	uplust.com	104.26.1.88	Succeeded
184	video-one.com	104.27.170.57	Succeeded
185	videos.petardas.com	176.31.233.179	Succeeded
186	viewmature.com	185.117.88.54	Succeeded
187	vintagehairy.net	204.93.61.114	Succeeded
188	vipoldies.net	162.251.108.168	Succeeded
189	vivthomas.com	207.66.141.189	Succeeded
190	webpnudes.com	154.212.230.194	Succeeded
191	wegret.com	185.53.179.6	Succeeded
192	wetmaturewhores.com	162.251.110.37	Succeeded
193	wetmaturewomen.com	162.251.108.26	Succeeded
194	wixvi.com	159.69.83.207	Succeeded
195	womenmaturepics.com	192.133.138.52	Succeeded
196	www.30plusgirls.com	23.92.77.103	Succeeded
197	www.30yomilf.com	107.165.59.101	Succeeded
198	www.3movs.com	92.38.179.155	Succeeded
199	www.7feel.net	169.47.149.241	Succeeded
200	www.89.com	192.185.6.23	Succeeded
201	www.8nsex.com	162.251.111.159	Succeeded
202	www.adultreviews.com	104.26.14.89	Succeeded
203	www.agedcunts.net	67.227.226.240	Succeeded
204	www.agedmamas.com	104.27.189.22	Succeeded
205	www.ah-me.com	192.243.54.122	Succeeded
206	www.alexmatures.com	104.27.161.241	Succeeded
207	www.allindiansex.com	64.59.116.160	Succeeded
208	www.alloldpics.com	206.54.191.187	Succeeded
209	www.alohatube.com	88.85.67.122	Succeeded
210	www.amazingmatureslut s.com	199.182.107.5	Succeeded
211	www.analsexstars.com	67.22.49.2	Succeeded
212	www.arabesexy.com	172.98.192.37	Succeeded
213	www.ashleyrnadison.com	104.17.153.191	Succeeded
214	www.asiatique-femme.com	46.166.189.98	Succeeded
215	www.askyourmommy.com	46.229.174.95	Succeeded

216	www.ass-butt.com	67.227.226.240	Succeeded
217	www.azgals.com	104.27.172.2	Succeeded
218	www.babes.com	66.254.114.54	Succeeded
219	www.babosas.com	5.145.172.201	Succeeded
220	www.barstoolsports.com	104.18.253.91	Succeeded
221	www.bbwpornpics.com	78.140.144.2	Succeeded
222	www.bestmatureclips.com	91.195.240.87	Succeeded
223	www.bestmilftube.com	46.229.160.222	Succeeded
224	www.bigboobsalert.com	104.200.146.182	Succeeded
225	www.bigbuttmature.com	67.212.234.206	Succeeded
226	www.bigfreemature.com	35.186.238.101	Succeeded
227	www.bigtinz.com	103.224.212.222	Succeeded
228	www.bigtitsmilf.com	78.140.190.131	Succeeded
229	www.bigtitsnaked.com	103.224.182.251	Succeeded
230	www.bollywood-sex.net	99.192.129.55	Succeeded
231	www.bravomamas.com	78.140.134.180	Succeeded
232	www.brazzers.com	216.18.168.70	Succeeded
233	www.brazzersnetwork.com	216.18.168.71	Succeeded
234	www.breeolson.com	35.196.188.144	Succeeded
235	www.bubblebuttpics.com	188.72.222.195	Succeeded
236	www.bullporn.com	46.229.166.165	Succeeded
237	www.bushypussies.net	74.117.176.189	Succeeded
238	www.buzzwok.com	184.168.221.44	Succeeded
239	www.cerdas.com	91.192.111.145	Succeeded
240	www.cheatwife.com	134.19.181.138	Succeeded
241	www.chocomilf.com	104.27.181.68	Succeeded
242	www.cholotube.com	68.183.54.129	Succeeded
243	www.chubbygalls.com	208.94.234.226	Succeeded
244	www.chubbygirlpics.com	185.49.146.140	Succeeded
245	www.classic-moms.com	199.115.115.67	Succeeded
246	www.cliphunter.com	99.192.226.225	Succeeded
247	www.clit7.com	103.9.193.13	Succeeded
248	www.cloaktube.com	46.229.166.165	Succeeded
249	www.cocomilfs.com	109.206.176.27	Succeeded
250	www.comicmasala.com	35.186.238.101	Succeeded

251	www.conejox.com	104.27.160.108	Succeeded
252	www.culx.org	23.110.157.204	Succeeded
253	www.cumlouder.com	104.24.106.121	Succeeded
254	www.dailyolders.com	199.115.115.67	Succeeded
255	www.darering.com	192.64.147.171	Succeeded
256	www.desikahani.net	104.31.83.215	Succeeded
257	www.desikamasutra.com	162.255.119.250	Succeeded
258	www.desipapa.com	104.31.86.118	Succeeded
259	www.desitales.com	104.27.137.240	Succeeded
260	www.dianapost.com	209.95.51.189	Succeeded
261	www.digitalplayground.com	66.254.114.54	Succeeded
262	www.disco-girls.com	159.69.83.207	Succeeded
263	www.drtuber.com	78.140.187.214	Succeeded
264	www.dustyporn.com	208.69.117.248	Succeeded
265	www.ebonyfantasies.com	88.85.69.12	Succeeded
266	www.eeltube.com	46.229.166.165	Succeeded
267	www.el-ladies.com	216.201.93.56	Succeeded
268	www.elderly-women.com	95.211.213.51	Succeeded
269	www.empflix.com	172.104.74.140	Succeeded
270	www.epicporntube.com	45.32.3.213	Succeeded
271	www.eporner.com	82.192.65.65	Succeeded
272	www.eromatures.net	74.117.176.189	Succeeded
273	www.eros.com	107.154.184.161	Succeeded
274	www.erotic-olders.com	199.115.115.67	Succeeded
275	www.eternaldesire.com	207.66.141.189	Succeeded
276	www.everydaycams.com	134.73.145.188	Succeeded
277	www.fakku.net	104.20.208.29	Succeeded
278	www.fatsexygirls.net	74.117.176.189	Succeeded
279	www.fillechaude.com	35.186.238.101	Succeeded
280	www.filthymamas.com	74.117.176.218	Succeeded
281	www.filthyoldies.com	74.117.176.8	Succeeded
282	www.find-best-lingerie.com	188.72.222.52	Succeeded
283	www.find-best-videos.com	188.42.227.133	Succeeded
284	www.flirthookup.com	34.240.48.68	Succeeded
285	www.free-porn-pics.net	95.211.213.51	Succeeded

286	www.freekiloclips.com	188.42.227.132	Succeeded
287	www.freematurepornpics.com	109.206.166.18	Succeeded
288	www.freemilfpornpics.com	109.206.164.185	Succeeded
289	www.freemilfsite.com	103.224.182.241	Succeeded
290	www.fresholders.com	199.115.115.67	Succeeded
291	www.freshporn.info	192.154.224.3	Succeeded
292	www.fuckcuck.com	88.208.36.189	Succeeded
293	www.fucking8.com	103.224.182.251	Succeeded
294	www.fuckmaturewhore.com	192.133.138.49	Succeeded
295	www.funjadu.com	103.224.212.222	Succeeded
296	www.galsarchive.com	95.211.213.51	Succeeded
297	www.gay43.com	67.227.226.240	Succeeded
298	www.gayboystube.com	205.204.90.162	Succeeded
299	www.gaytube.com	66.254.114.158	Succeeded
300	www.gggay.com	64.59.106.247	Succeeded
301	www.gonzo.com	141.0.173.147	Succeeded
302	www.goodgrannypics.com	103.224.212.222	Succeeded
303	www.gorgeousladies.com	91.195.240.126	Succeeded
304	www.gracefulmilf.com	104.27.136.11	Succeeded
305	www.gracefulmom.com	104.27.147.201	Succeeded
306	www.gracefulnudes.com	67.227.226.241	Succeeded
307	www.grandmammapics.com	188.42.230.212	Succeeded
308	www.grannyhairy.net	69.16.230.42	Succeeded
309	www.grannypornpics.net	109.206.165.122	Succeeded
310	www.gratishentai.net	52.68.84.63	Succeeded
311	www.hairymaturegirls.com	67.227.226.240	Succeeded
312	www.hairymilfpics.com	88.85.69.10	Succeeded
313	www.hardsextube.com	104.26.8.104	Succeeded
314	www.hdrolet.com	184.168.131.241	Succeeded
315	www.heganporn.com	72.52.179.175	Succeeded
316	www.herbalviagraworld.com	50.87.144.177	Succeeded
317	www.hindisex.com	108.167.189.67	Succeeded
318	www.home-madness.com	104.28.6.223	Succeeded
319	www.horny-olders.com	95.211.213.51	Succeeded
320	www.hotmomspics.com	67.212.234.206	Succeeded

321	www.hotmomsporn.com	109.206.164.191	Succeeded
322	www.hotnakedoldies.com	192.133.138.52	Succeeded
323	www.hotnudematures.com	95.211.213.51	Succeeded
324	www.hqmaturemovs.com	103.224.212.222	Succeeded
325	www.hqoldies.com	104.28.28.119	Succeeded
326	www.idealmilf.com	206.54.182.50	Succeeded
327	www.idealwifes.com	88.85.69.11	Succeeded
328	www.iknowthatgirl.com	66.254.114.54	Succeeded
329	www.imagefap.com	109.201.130.57	Succeeded
330	www.immodestmoms.com	103.224.212.222	Succeeded
331	www.indiangilma.com	104.31.7.171	Succeeded
332	www.indiankahani.com	103.224.212.222	Succeeded
333	www.indianpornovid.com	103.224.212.222	Succeeded
334	www.indianpornvideos.com	104.27.153.249	Succeeded
335	www.indiansexstories.net	104.18.54.71	Succeeded
336	www.indienne-sexy.com	185.94.237.24	Succeeded
337	www.iscindia.org	198.252.102.210	Succeeded
338	www.ixxx-tube.com	208.91.197.46	Succeeded
339	www.ixxx.ws	185.53.178.7	Succeeded
340	www.jeffdunhamfuckdoll.com	184.168.131.241	Succeeded
341	www.jizzhut.com	31.192.122.226	Succeeded
342	www.joncjg.blogspot.in	172.217.166.193	Succeeded
343	www.juliepost.com	169.47.149.241	Succeeded
344	www.keezmovies.com	31.192.116.179	Succeeded
345	www.kickass.com	104.28.2.67	Succeeded
346	www.kilopics.com	188.72.222.52	Succeeded
347	www.kingsizebreasts.com	162.251.108.162	Succeeded
348	www.kink.com	104.20.214.2	Succeeded
349	www.kissmaturesgo.com	88.214.207.162	Succeeded
350	www.ladymom.com	188.42.230.212	Succeeded
351	www.leche69.com	69.50.141.173	Succeeded
352	www.lewd-girls.com	154.201.114.172	Succeeded
353	www.lewdmistress.com	103.224.212.222	Succeeded
354	www.liberteenage.com	54.37.57.61	Succeeded
355	www.livjasmin.com	66.154.78.100	Succeeded

356	www.locasporfollar.com	103.224.212.222	Succeeded
357	www.lustfuloldies.com	103.224.212.222	Succeeded
358	www.madmamas.com	104.31.75.134	Succeeded
359	www.maghrebinnes.xl.cx	5.135.149.81	Succeeded
360	www.mamitatube.com	67.227.226.240	Succeeded
361	www.mature-for-you.com	159.69.186.9	Succeeded
362	www.mature-library.com	95.211.213.51	Succeeded
363	www.mature-orgasm.com	185.49.146.139	Succeeded
364	www.mature.nl	216.201.93.50	Succeeded
365	www.mature30-45.com	213.174.130.108	Succeeded
366	www.matureal.com	109.206.168.80	Succeeded
367	www.matureandgranny.com	67.227.226.240	Succeeded
368	www.matureandyoung.com	194.187.99.186	Succeeded
369	www.matureasspics.com	188.72.216.147	Succeeded
370	www.maturecherry.net	74.117.176.189	Succeeded
371	www.maturecool.com	213.174.130.108	Succeeded
372	www.matureguide.com	204.11.56.37	Succeeded
373	www.maturehotsex.com	159.69.42.212	Succeeded
374	www.matureintros.com	88.208.29.100	Succeeded
375	www.matureladies.com	72.52.179.175	Succeeded
376	www.matureladiespics.com	107.150.28.19	Succeeded
377	www.matureland.net	78.140.163.203	Succeeded
378	www.maturemompics.com	109.206.166.23	Succeeded
379	www.maturemomsex.com	109.206.166.15	Succeeded
380	www.maturepicsarchive.com	67.227.226.240	Succeeded
381	www.maturepornhere.com	99.192.136.230	Succeeded
382	www.maturepornpics.com	78.140.144.2	Succeeded
383	www.maturesensations.com	67.227.226.240	Succeeded
384	www.maturosexy.com	213.174.159.181	Succeeded
385	www.mc-nudes.com	98.124.199.77	Succeeded
386	www.megavideoporno.org	37.48.65.153	Succeeded
387	www.milfbank.com	206.54.167.211	Succeeded
388	www.milfionaire.com	104.28.26.51	Succeeded
389	www.milfjam.com	109.206.164.164	Succeeded
390	www.milfmomspics.com	78.140.163.202	Succeeded

391	www.milfparanoia.com	74.117.219.199	Succeeded
392	www.milfpicshere.com	104.254.83.124	Succeeded
393	www.milfsarea.com	109.206.176.27	Succeeded
394	www.milfsbeach.com	109.206.176.27	Succeeded
395	www.momhandjob.com	185.53.179.7	Succeeded
396	www.momsclan.com	46.229.160.188	Succeeded
397	www.momsecstasy.com	104.27.168.174	Succeeded
398	www.momsforporn.com	104.248.108.187	Succeeded
399	www.momshere.com	204.155.154.52	Succeeded
400	www.momsnightjob.com	154.212.144.195	Succeeded
401	www.momstaboo.com	74.117.176.228	Succeeded
402	www.mrskin.com	151.139.128.10	Succeeded
403	www.mulligansmilfs.com	109.206.176.27	Succeeded
404	www.multimature.com	204.11.56.48	Succeeded
405	www.myfreecams.com	163.237.225.37	Succeeded
406	www.myhotsite.net	185.53.178.9	Succeeded
407	www.mynakedteens.com	109.206.164.129	Succeeded
408	www.myonlyhd.com	199.191.50.140	Succeeded
409	www.naked-moms.com	104.171.23.70	Succeeded
410	www.nakedbustytits.com	67.227.226.240	Succeeded
411	www.naughty.com	207.178.206.89	Succeeded
412	www.nexxx.com	104.24.121.137	Succeeded
413	www.nude-oldies.com	95.211.213.51	Succeeded
414	www.nudeartstars.com	80.77.82.232	Succeeded
415	www.nudematuremix.com	64.32.8.67	Succeeded
416	www.nudematurepussy.com	109.206.176.22	Succeeded
417	www.nudematurespics.com	95.211.213.51	Succeeded
418	www.nudemomandboy.com	159.69.83.207	Succeeded
419	www.nudemomphotos.com	67.227.226.240	Succeeded
420	www.nudeold.com	23.228.217.200	Succeeded
421	www.nudevista.com	74.117.179.67	Succeeded
422	www.numoms.com	209.99.64.43	Succeeded
423	www.nuvid.com	88.208.39.131	Succeeded
424	www.old-vulva.com	159.69.42.212	Succeeded
425	www.older-beauty.com	87.117.229.10	Succeeded

426	www.oldercherry.com	104.171.23.70	Succeeded
427	www.olderkiss.com	104.28.18.64	Succeeded
428	www.olderwomentaboo.com	104.27.164.18	Succeeded
429	www.oldhotmoms.com	35.186.238.101	Succeeded
430	www.oldmomstgp.com	95.211.213.51	Succeeded
431	www.oldpoon.com	78.140.135.98	Succeeded
432	www.oldsweet.com	194.187.99.134	Succeeded
433	www.onlyporngif.com	208.91.197.46	Succeeded
434	www.owerotica.com	103.224.212.222	Succeeded
435	www.pamelapost.com	209.95.51.189	Succeeded
436	www.peliculaspornogratisxxx.com	104.27.166.249	Succeeded
437	www.penguinvids.com	104.27.172.121	Succeeded
438	www.perucaseras.com	67.23.239.51	Succeeded
439	www.petardas.com	137.74.206.86	Succeeded
440	www.picsboob.com	188.42.230.212	Succeeded
441	www.pinkcupid.com	104.108.199.142	Succeeded
442	www.pinkteenpics.com	109.202.107.132	Succeeded
443	www.pinkworld.com	64.111.221.56	Succeeded
444	www.pinsex.com	72.52.10.14	Succeeded
445	www.playboy.com	143.204.214.9	Succeeded
446	www.playvid.com	199.101.134.7	Succeeded
447	www.pof.com	104.18.16.5	Succeeded
448	www.poringa.net	104.26.3.180	Succeeded
449	www.porn.com	67.22.49.255	Succeeded
450	www.porn00.org	104.27.146.58	Succeeded
451	www.porndig.com	104.16.123.32	Succeeded
452	www.pornerbros.com	104.16.170.16	Succeeded
453	www.pornhub.com	66.254.114.41	Succeeded
454	www.pornmaturepics.com	74.117.176.189	Succeeded
455	www.pornmaturewomen.com	109.206.166.16	Succeeded
456	www.pornmdk.com	35.186.238.101	Succeeded
457	www.pornmotion.com	64.156.26.74	Succeeded
458	www.porno-algerienne.com	185.98.131.43	Succeeded
459	www.porno.com	141.0.173.133	Succeeded
460	www.pornodoido.com	104.31.0.184	Succeeded

461	www.pornorama.com	104.17.25.71	Succeeded
462	www.pornorc.net	88.85.78.176	Succeeded
463	www.pornoriver.net	188.72.222.221	Succeeded
464	www.pornstarhangout.com	67.227.226.240	Succeeded
465	www.pornsticky.com	188.72.216.148	Succeeded
466	www.porntube.com	104.18.148.225	Succeeded
467	www.porntubevidz.com	64.210.145.56	Succeeded
468	www.pornxxx.com	34.194.74.143	Succeeded
469	www.posing-matures.com	199.115.115.67	Succeeded
470	www.posingwomen.com	199.115.115.67	Succeeded
471	www.premiercastingporno.com	185.18.81.24	Succeeded
472	www.premium.gays.com	213.208.129.118	Succeeded
473	www.pretty-matures.com	199.115.115.67	Succeeded
474	www.primecurves.com	99.192.140.124	Succeeded
475	www.private.com	173.239.49.221	Succeeded
476	www.purebbwtube.com	46.229.162.122	Succeeded
477	www.puritanas.com	104.26.6.249	Succeeded
478	www.pussy-mature.com	68.169.98.106	Succeeded
479	www.randyhags.com	103.224.182.251	Succeeded
480	www.redtube.com	216.18.168.124	Succeeded
481	www.riomature.com	204.155.154.49	Succeeded
482	www.riomilf.com	204.155.154.49	Succeeded
483	www.riomoms.com	204.155.154.49	Succeeded
484	www.riotits.net	204.155.154.49	Succeeded
485	www.rk.com	66.254.114.54	Succeeded
486	www.roundandbrown.com	66.254.114.54	Succeeded
487	www.rubber-kingdom.com	204.15.255.164	Succeeded
488	www.rubias19.com	104.25.90.6	Succeeded
489	www.secretarypics.com	188.72.222.195	Succeeded
490	www.serviporno.com	104.26.10.243	Succeeded
491	www.sex.com	15.222.131.21	Succeeded
492	www.sexe2asiatique.com	104.18.41.42	Succeeded
493	www.sexocean.com	104.254.83.164	Succeeded
494	www.sexualolders.com	199.115.115.67	Succeeded
495	www.sexxxdoll.com	51.79.17.34	Succeeded

496	www.sexy-olders.com	199.115.115.67	Succeeded
497	www.sexybuttpics.com	185.49.146.140	Succeeded
498	www.sexyhotmilf.com	109.202.100.35	Succeeded
499	www.sexyhotmilfs.com	109.206.176.17	Succeeded
500	www.sexymaturethumbs.com	104.27.150.14	Succeeded
501	www.sexymilfpussy.com	109.206.164.183	Succeeded
502	www.sexyteensphotos.com	109.206.164.245	Succeeded
503	www.sharedxpics.com	91.195.240.68	Succeeded
504	www.slutload.com	216.18.168.205	Succeeded
505	www.spankwire.com	216.18.168.178	Succeeded
506	www.specialgays.com	99.192.185.32	Succeeded
507	www.stripping-moms.com	95.211.213.51	Succeeded
508	www.sweetmaturepics.com	103.224.182.251	Succeeded
509	www.teencamvids.org	67.227.226.240	Succeeded
510	www.teenhana.com	136.0.190.162	Succeeded
511	www.teenpornxxx.net	199.38.240.106	Succeeded
512	www.teensnowxvideos.com	67.22.49.16	Succeeded
513	www.tgpmaturewoman.com	192.133.138.49	Succeeded
514	www.thegranny.net	67.227.226.240	Succeeded
515	www.thehotpics.com	5.79.68.108	Succeeded
516	www.thematureladies.com	78.140.190.55	Succeeded
517	www.theofficiallouisejenson.com	66.115.129.138	Succeeded
518	www.thexmilf.com	104.18.53.183	Succeeded
519	www.tinysolo.com	104.28.7.129	Succeeded
520	www.tnaflix.com	172.105.206.81	Succeeded
521	www.toonztube.com	172.98.192.37	Succeeded
522	www.truthordarepics.com	66.154.95.224	Succeeded
523	www.tube8.com	216.18.168.66	Succeeded
524	www.tubefellas.com	162.210.196.167	Succeeded
525	www.tubegogo.com	185.73.221.214	Succeeded
526	www.tubexclips.com	46.229.162.251	Succeeded
527	www.tukif.com	104.16.245.250	Succeeded
528	www.uniquesexymoms.com	74.117.176.189	Succeeded
529	www.universeold.com	188.42.230.212	Succeeded
530	www.unshavengirls.net	74.117.176.189	Succeeded

531	www.upskirt.com	173.208.207.154	Succeeded
532	www.videospornonacional.com	103.224.182.207	Succeeded
533	www.videosxxxputas.xxx	104.26.2.216	Succeeded
534	www.watchersweb.com	208.86.0.200	Succeeded
535	www.watchmygf.com	216.18.164.37	Succeeded
536	www.wetmaturepics.com	67.227.226.240	Succeeded
537	www.wifesbank.com	206.54.167.210	Succeeded
538	www.wifezilla.com	78.140.143.23	Succeeded
539	www.womanolder.com	54.37.99.76	Succeeded
540	www.womeninyears.com	104.28.29.102	Succeeded
541	www.womenmaturepics.com	192.133.138.52	Succeeded
542	www.worldxxxphotos.com	91.195.240.126	Succeeded
543	www.x-art.com	74.206.167.247	Succeeded
544	www.xebonygirls.com	103.224.212.222	Succeeded
545	www.xmilfpics.com	188.42.230.212	Succeeded
546	www.xtube.com	66.254.114.138	Succeeded
547	www.xtube.nom.co	104.28.31.61	Succeeded
548	www.xvideosnacional.com	103.224.182.207	Succeeded
549	www.xxx.com	141.0.173.173	Succeeded
550	www.xxxkinky.com	104.25.104.27	Succeeded
551	www.xxxmaturepost.com	104.27.134.13	Succeeded
552	www.xxxolders.com	154.214.229.60	Succeeded
553	www.xxxvideosex.org	198.12.125.157	Succeeded
554	www.yasminramos.com	91.121.24.162	Succeeded
555	www.youjizz.com	216.18.168.162	Succeeded
556	www.youngxxxpics.com	109.202.107.134	Succeeded
557	www.youporn.com	66.254.114.79	Succeeded
558	www.yourlustgirlfriends.com	103.224.182.207	Succeeded
559	xbabe.com	88.208.55.35	Succeeded
560	xesi.mobi	35.186.238.101	Succeeded
561	xhamster.com	104.18.156.3	Succeeded
562	xhot.sextgem.com	54.36.158.42	Succeeded
563	xnxx-free.net	37.48.65.150	Succeeded
564	xnxx.vc	185.53.179.7	Succeeded
565	xpornking.com	104.31.72.8	Succeeded

566	xxx.com	141.0.173.173	Succeeded
567	xxxbunker.com	77.247.181.42	Succeeded
568	xxxmaturepost.com	104.27.135.13	Succeeded
569	xxxonxxx.com	104.27.137.226	Succeeded
570	xxxsummer.net	93.115.28.104	Succeeded
571	youjizz.ws	185.53.178.7	Succeeded
572	youngmint.com	134.19.181.138	Succeeded
573	yourlust.com	78.140.178.84	Succeeded

Dataset (L)

List of 127 Hosts for Request Timeout Response

S. No.	Host Name	IP Address	Status
1	18teensexposed.tumblr.com	66.6.33.21	RTO
2	4hen.com	162.210.199.65	RTO
3	action36.com	162.222.213.198	RTO
4	actuallyattractiveamateurs.tumblr.com	66.6.32.21	RTO
5	amateur-sexys.tumblr.com	66.6.33.149	RTO
6	awesomeellalove.tumblr.com	66.6.33.21	RTO
7	bananabunny.com	66.6.44.4	RTO
8	beautyandthebeard1.tumblr.com	66.6.32.21	RTO
9	beeg.com	192.243.54.98	RTO
10	bettermilfs.com	108.61.19.11	RTO
11	bigdickswillingchicks.tumblr.com	66.6.33.21	RTO
12	boytikol.com	108.61.19.14	RTO
13	cuckinohio.tumblr.com	66.6.33.21	RTO
14	dildosatisfaction.tumblr.com	66.6.33.149	RTO
15	eatyouout.tumblr.com	66.6.33.21	RTO
16	en.cam4.com.br	217.22.17.248	RTO
17	every-seconds.tumblr.com	66.6.33.21	RTO
18	excitingmatures.com	75.126.104.247	RTO
19	fr.perfectgirls.net	185.240.29.82	RTO
20	freesex.com	35.165.255.15	RTO
21	fuckmycheatingslutwife.tumblr.com	66.6.33.149	RTO
22	girthyencounters.tumblr.com	66.6.33.149	RTO
23	hairy.com	207.246.147.189	RTO

24	hothomemadepix.tumblr.com	66.6.33.21	RTO
25	ilovematurewomen.tumblr.com	66.6.33.149	RTO
26	jpangel101.tumblr.com	66.6.33.149	RTO
27	jrunk.tumblr.com	66.6.33.21	RTO
28	kickass.co	199.59.242.153	RTO
29	lisaannlovers11.tumblr.com	66.6.32.21	RTO
30	live.sugarbbw.com	3.214.118.59	RTO
31	luboeporno.com	162.222.213.197	RTO
32	mature4.net	185.117.88.53	RTO
33	matureamour.com	94.229.72.117	RTO
34	maturedummy.com	162.210.196.166	RTO
35	maturepornhub.com	199.59.242.153	RTO
36	matureshine.com	46.166.182.52	RTO
37	maturestation.com	162.222.213.197	RTO
38	megamovie.us	37.48.65.136	RTO
39	mindslostinlust.tumblr.com	66.6.33.21	RTO
40	momsteachsex.com	46.182.108.7	RTO
41	motherless.com	46.166.188.35	RTO
42	mypornbookmarks.com	18.184.9.116	RTO
43	nonvegjokes.com	217.160.25.152	RTO
44	nudeboobshotpics.com	68.169.101.238	RTO
45	nudedares.tumblr.com	66.6.32.21	RTO
46	pahubad.com	54.72.130.67	RTO
47	popurls.com	34.215.60.170	RTO
48	porny.com	199.59.242.153	RTO
49	rude.com	52.6.186.218	RTO
50	store.falconstudios.com	3.95.75.106	RTO
51	stretchedpussy.tumblr.com	66.6.33.149	RTO
52	teen18ass.com	162.222.213.199	RTO
53	teengayporntube.com	108.61.19.12	RTO
54	thefreecamsecret.com	216.127.52.173	RTO
55	upskirttop.net	81.171.22.7	RTO
56	webcam.com	207.246.147.190	RTO
57	whoresmilfsdegraded.tumblr.com	66.6.32.21	RTO
58	wild-matures.com	154.207.61.2	RTO

59	woodstockreborn.tumblr.com	66.6.32.21	RTO
60	www.40somethingmag.com	209.208.211.200	RTO
61	www.adultphonechatlines.co.uk	83.223.106.15	RTO
62	www.antarvasna.com	104.31.12.185	RTO
63	www.ass4all.com	185.88.181.6	RTO
64	www.aztecaporno.com	167.99.224.113	RTO
65	www.beeg.co	13.48.229.177	RTO
66	www.befuck.com	208.88.225.92	RTO
67	www.cindymovies.com	185.88.181.59	RTO
68	www.collegehumor.com	52.52.239.242	RTO
69	www.dagay.com	54.164.91.72	RTO
70	www.deviantclip.com	23.23.61.2	RTO
71	www.dreammovies.com	185.88.181.60	RTO
72	www.eroticbeauties.net	64.188.52.53	RTO
73	www.flirt4free.com	204.8.234.144	RTO
74	www.freeones.ch	45.32.2.93	RTO
75	www.freeones.com	45.32.2.94	RTO
76	www.freeporndr.com	154.214.44.202	RTO
77	www.freesex.com	35.165.255.15	RTO
78	www.fuq.com	167.99.0.49	RTO
79	www.gentlemoms.com	108.61.19.13	RTO
80	www.gonzoxxxmovies.com	157.245.250.125	RTO
81	www.hairy.com	207.246.147.190	RTO
82	www.hotsexyteensphotos.com	64.188.57.16	RTO
83	www.imomsex.com	109.206.166.4	RTO
84	www.ixxx.com	167.99.149.1	RTO
85	www.jeux-flash-sexy.com	213.186.33.16	RTO
86	www.jizzle.com	185.88.181.59	RTO
87	www.katestube.com	68.169.100.102	RTO
88	www.labatidora.net	52.8.100.148	RTO
89	www.ledauphine.com	145.226.55.17	RTO
90	www.lushstories.com	67.215.246.22	RTO
91	www.maturepornqueens.net	109.206.168.81	RTO
92	www.maturetube.com	167.99.226.30	RTO
93	www.milfkiss.com	109.206.164.166	RTO

94	www.milfmovs.com	185.88.181.58	RTO
95	www.milftubevids.com	34.202.122.77	RTO
96	www.muyzorras.com	184.154.111.157	RTO
97	www.myhdshop.com	162.210.196.167	RTO
98	www.nakedboobs.net	68.169.101.238	RTO
99	www.nudematurewomenphotos.com	64.188.57.28	RTO
100	www.onlygirlvideos.com	185.88.181.54	RTO
101	www.pandamovies.com	167.99.149.1	RTO
102	www.perfectgirls.net	185.240.29.63	RTO
103	www.pinksofa.com	40.126.247.120	RTO
104	www.place21.com	52.4.209.250	RTO
105	www.sambaporno.com	134.209.220.127	RTO
106	www.secinsurance.com	199.59.242.153	RTO
107	www.sexy-links.net	64.111.197.114	RTO
108	www.sexynakedamateurgirls.com	64.188.57.15	RTO
109	www.shemales.com	3.130.10.176	RTO
110	www.shitbrix.com	52.73.147.107	RTO
111	www.teensnow.com	185.88.181.55	RTO
112	www.thefreecamsecret.com	216.127.52.174	RTO
113	www.top-chatroulette.com	165.160.13.20	RTO
114	www.toroporno.com	167.99.224.115	RTO
115	www.tubegalore.com	134.209.126.213	RTO
116	www.tubepornstars.com	167.99.147.227	RTO
117	www.tubestack.com	157.245.129.78	RTO
118	www.x-ho.com	185.88.181.53	RTO
119	www.xixx.com	199.59.242.153	RTO
120	www.xnxx.com	185.88.181.55	RTO
121	www.xvideos.com	185.88.181.3	RTO
122	www.xxx.xxx	34.231.250.252	RTO
123	www.yehfun.com	199.59.242.153	RTO
124	www.youngpornvideos.com	208.99.76.166	RTO
125	xxx.adulttube.com	13.48.229.177	RTO
126	xxxvideo.com	64.38.232.180	RTO
127	yourather.com	174.129.6.131	RTO

Dataset (M)

List of 108 Hosts for Status Code Response 200

S. No.	URL	Code	Status
1	http://bettermilfs.com/	200	OK
2	http://fr.perfectgirls.net/	200	OK
3	http://matureamour.com/	200	OK
4	http://momsteachsex.com/	200	OK
5	http://mature4.net/	200	OK
6	http://pahubad.com/	200	OK
7	http://mypornbookmarks.com/	200	OK
8	http://action36.com/	200	OK
9	http://4hen.com/	200	OK
10	http://megamovie.us/	200	OK
11	http://bananabunny.com/	200	OK
12	http://dildosatisfaction.tumblr.com/	200	OK
13	http://maturestation.com/	200	OK
14	http://motherless.com/	200	OK
15	http://ilovematurewomen.tumblr.com/	200	OK
16	http://luboeporno.com/	200	OK
17	http://matureporнhub.com/	200	OK
18	http://eatyouout.tumblr.com/	200	OK
19	http://freesex.com/	200	OK
20	http://porny.com/	200	OK
21	http://boytikol.com/	200	OK
22	http://matureshine.com/	200	OK
23	http://excitingmatures.com/	200	OK
24	http://hairy.com/	200	OK
25	http://amateur-sexys.tumblr.com/	200	OK
26	http://maturedummy.com/	200	OK
27	http://en.cam4.com.br/	200	OK
28	http://beeg.com/	200	OK
29	http://hothomemadepix.tumblr.com/	200	OK
30	http://store.falconstudios.com/	200	OK
31	http://cuckinohio.tumblr.com/	200	OK
32	http://live.sugarbbw.com/	200	OK

33	http://fuckmycheatingslutwife.tumblr.com/	200	OK
34	http://rude.com/	200	OK
35	http://beautyandthebeard1.tumblr.com/	200	OK
36	http://awesomeellalove.tumblr.com/	200	OK
37	http://18teensexposed.tumblr.com/	200	OK
38	http://girthyencounters.tumblr.com/	200	OK
39	http://lisaannlovers11.tumblr.com/	200	OK
40	http://bigdickswillingchicks.tumblr.com/	200	OK
41	http://nudedares.tumblr.com/	200	OK
42	http://teen18ass.com/	200	OK
43	http://kickass.co/	200	OK
44	http://beeg.co/	200	OK
45	http://antarvasna.com/	200	OK
46	http://aztecaporno.com/	200	OK
47	http://teengayporntube.com/	200	OK
48	http://stretchedpussy.tumblr.com/	200	OK
49	http://upskirttop.net/	200	OK
50	http://webcam.com/	200	OK
51	http://nudeboobshotpics.com/	200	OK
52	http://40somethingmag.com/	200	OK
53	http://jeux-flash-sexy.com/	200	OK
54	http://adultphonechatlines.co.uk/	200	OK
55	http://imomsex.com/	200	OK
56	http://popurls.com/	200	OK
57	http://freeones.com/	200	OK
58	http://freeones.ch/	200	OK
59	http://fuq.com/	200	OK
60	http://gonzoxxxmovies.com/	200	OK
61	http://maturepornqueens.net/	200	OK
62	http://ixxx.com/	200	OK
63	http://collegehumor.com/	200	OK
64	http://flirt4free.com/	200	OK
65	http://whoresmilfsdegraded.tumblr.com/	200	OK
66	http://hotsexyteensphotos.com/	200	OK
67	http://labatidora.net/	200	OK

68	http://maturetube.com/	200	OK
69	http://milfkiss.com/	200	OK
70	http://milfmovs.com/	200	OK
71	http://lushstories.com/	200	OK
72	http://woodstockreborn.tumblr.com/	200	OK
73	http://cindymovies.com/	200	OK
74	http://ass4all.com/	200	OK
75	http://perfectgirls.net/	200	OK
76	http://thefreecamsecret.com/	200	OK
77	http://muyzorras.com/	200	OK
78	http://dreammovies.com/	200	OK
79	http://pandamovies.com/	200	OK
80	http://sambaporno.com/	200	OK
81	http://teensnow.com/	200	OK
82	http://nudematurewomenphotos.com/	200	OK
83	http://nakedboobs.net/	200	OK
84	http://freeporndr.com/	200	OK
85	http://jizzle.com/	200	OK
86	http://xnxx.com/	200	OK
87	http://x-ho.com/	200	OK
88	http://xvideos.com/	200	OK
89	http://eroticbeauties.net/	200	OK
90	http://myhdshop.com/	200	OK
91	http://gentlemoms.com/	200	OK
92	http://tubegalore.com/	200	OK
93	http://sexynakedamateurgirls.com/	200	OK
94	http://shitbrix.com/	200	OK
95	http://tubepornstars.com/	200	OK
96	http://toroporno.com/	200	OK
97	http://katestube.com/	200	OK
98	http://tubestack.com/	200	OK
99	http://secinsurance.com/	200	OK
100	http://yehfun.com/	200	OK
101	http://youngpornvideos.com/	200	OK
102	http://top-chatroulette.com/	200	OK

103	http://xxxvideo.com/	200	OK
104	http://onlygirlvideos.com/	200	OK
105	http://sexy-links.net/	200	OK
106	http://yourather.com/	200	OK
107	http://xixx.com/	200	OK
108	http://place21.com/	200	OK

Dataset (N)

List of 142 Hosts for Bad Host Name (BHN) Response

S. No.	Host Name	Failed %	Status
1	7dog.com	100.00%	BHN
2	amapics.net	100.00%	BHN
3	bestmilfsporn.com	100.00%	BHN
4	bigtitsporn.me	100.00%	BHN
5	bitefaim.com	100.00%	BHN
6	blogfalconstudios.com	100.00%	BHN
7	bootlus.com	100.00%	BHN
8	boyddl.com	100.00%	BHN
9	chaudassedusexe.com	100.00%	BHN
10	cochonnevideosx.com	100.00%	BHN
11	eroticplace.net	100.00%	BHN
12	femmesmuresx.net	100.00%	BHN
13	freshmatureporn.com	100.00%	BHN
14	girlygifporn.com	100.00%	BHN
15	goulnes.pornoxxxi.net	100.00%	BHN
16	grandmabesttube.com	100.00%	BHN
17	grannyxxx.co.uk	100.00%	BHN
18	hard.pornoxxl.org	100.00%	BHN
19	hardsexyyoupornhub.com	100.00%	BHN
20	horny-matures.net	100.00%	BHN
21	hotamateurclip.com	100.00%	BHN
22	indianporntube.xxx	100.00%	BHN
23	lovely-mature.net	100.00%	BHN
24	masturbationaddicton.net	100.00%	BHN
25	maturebabesporno.com	100.00%	BHN

26	matureholes.net	100.00%	BHN
27	matures-photos.com	100.00%	BHN
28	milf-fucking.net	100.00%	BHN
29	moncotube.net	100.00%	BHN
30	needmilf.com	100.00%	BHN
31	porn.mangassex.com	100.00%	BHN
32	pornhubfillesalope.com	100.00%	BHN
33	pornofemmeblack.com	100.00%	BHN
34	salope.1japonsex.com	100.00%	BHN
35	saoulbafjojo.com	100.00%	BHN
36	sex.pornoxxl.org	100.00%	BHN
37	sexbotbonnasse.com	100.00%	BHN
38	sexonapria.org	100.00%	BHN
39	teemns-pic.com	100.00%	BHN
40	teenpornjoy.com	100.00%	BHN
41	video-porno.1lecheuse.com	100.00%	BHN
42	video-porno.videurdecouilles.com	100.00%	BHN
43	video-sex.femmesx.net	100.00%	BHN
44	video.freex.mobl	100.00%	BHN
45	videos-porno.x18xxx.com	100.00%	BHN
46	videos-sexe.1touffe.com	100.00%	BHN
47	videos-x.xpornogays.com	100.00%	BHN
48	videosanalesx.com	100.00%	BHN
49	videosfilleschaudes.com	100.00%	BHN
50	wifenaked.net	100.00%	BHN
51	ww.lastsexe.com	100.00%	BHN
52	www.10pointz.com	100.00%	BHN
53	www.69rueporno.com	100.00%	BHN
54	www.amateur-libertins.net	100.00%	BHN
55	www.anatarvasnavideos.com	100.00%	BHN
56	www.arabe-sexy.com	100.00%	BHN
57	www.arabebaise.com	100.00%	BHN
58	www.beauxcul.com	100.00%	BHN
59	www.beurettehot.net	100.00%	BHN
60	www.bigboty4free.com	100.00%	BHN

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63	www.boutique-sexy.ch	100.00%	BHN
64	www.bravioteens.com	100.00%	BHN
65	www.callboyindia.com	100.00%	BHN
66	www.cam4.in	100.00%	BHN
67	www.cleomture.com	100.00%	BHN
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69	www.cullosgratis.com.ve	100.00%	BHN
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95	www.lesbiennesxxx.com	100.00%	BHN

96	www.llveleak.com	100.00%	BHN
97	www.marocainenue.com	100.00%	BHN
98	www.masalopeblack.com	100.00%	BHN
99	www.mature-galleries.org	100.00%	BHN
100	www.maturebrotherthumbs.com	100.00%	BHN
101	www.maturedally.net	100.00%	BHN
102	www.maturexxxclipz.com	100.00%	BHN
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112	www.omegaporno.com	100.00%	BHN
113	www.ovideox.com	100.00%	BHN
114	www.parejasfollando.es	100.00%	BHN
115	www.petiteporn.pw	100.00%	BHN
116	www.porn20.org	100.00%	BHN
117	www.porno-marocaine.com	100.00%	BHN
118	www.pornochaud.com	100.00%	BHN
119	www.pornocolumbia.co	100.00%	BHN
120	www.pornoforo.com	100.00%	BHN
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122	www.pornosfilms.com	100.00%	BHN
123	www.pornotantique.com	100.00%	BHN
124	www.pornovideo.italy.com	100.00%	BHN
125	www.pornstarnirvna.com	100.00%	BHN
126	www.redtuve.com	100.00%	BHN
127	www.salope-marocaine.com	100.00%	BHN
128	www.sexcoachapp.com	100.00%	BHN
129	www.sexe-evbony.com	100.00%	BHN
130	www.superdiosas.com	100.00%	BHN

131	www.teenpussy.pw	100.00%	BHN
132	www.tendance-lesbienne.com	100.00%	BHN
133	www.tubeduporno.com	100.00%	BHN
134	www.videos-porno-chaudes.com	100.00%	BHN
135	www.voyeurpipi.com	100.00%	BHN
136	www.wethairywats.com	100.00%	BHN
137	www.xgouines.com	100.00%	BHN
138	www.xnxxgifs.com	100.00%	BHN
139	www.xxxmomclips.com	100.00%	BHN
140	www.zmilfs.com	100.00%	BHN
141	xxi.onxxille.com	100.00%	BHN
142	xxl.sexgratuits.com	100.00%	BHN

Dataset (O)

List of 142 Hosts for Error Response 9002, 9003

S. No.	Host	Record Type	Status
1	amapics.net	A	Error 9003:
2	bestmilfsporn.com	A	Error 9003:
3	bigtitsporn.me	A	Error 9003:
4	bitefaim.com	A	Error 9003:
5	blogfalconstudios.com	A	Error 9003:
6	bootlus.com	A	Error 9003:
7	boyddl.com	A	Error 9003:
8	chaudassedusexe.com	A	Error 9003:
9	cochonnevideosx.com	A	Error 9003:
10	eroticplace.net	A	Error 9003:
11	femmesmuresx.net	A	Error 9003:
12	freshmatureporn.com	A	Error 9003:
13	girlygifporn.com	A	Error 9003:
14	goulnes.pornoxxxi.net	A	Error 9003:
15	grandmabesttube.com	A	Error 9003:
16	grannyxxx.co.uk	A	Error 9003:
17	hard.pornoxxl.org	A	Error 9003:
18	hardsexyyoupornhub.com	A	Error 9003:

19	horny-matures.net	A	Error 9003:
20	hotamateurclip.com	A	Error 9003:
21	indianporntube.xxx	A	Error 9003:
22	lovely-mature.net	A	Error 9003:
23	masturbationaddicton.net	A	Error 9003:
24	maturebabesporno.com	A	Error 9003:
25	matureholes.net	A	Error 9003:
26	matures-photos.com	A	Error 9003:
27	milf-fucking.net	A	Error 9003:
28	moncotube.net	A	Error 9003:
29	needmilf.com	A	Error 9003:
30	porn.mangassex.com	A	Error 9003:
31	pornhubfillesalope.com	A	Error 9003:
32	pornofemmeblack.com	A	Error 9003:
33	salope.1japonsex.com	A	Error 9003:
34	saoulbafjojo.com	A	Error 9003:
35	sex.pornoxxl.org	A	Error 9003:
36	sexbotbonnasse.com	A	Error 9003:
37	sexonapria.org	A	Error 9003:
38	teemns-pic.com	A	Error 9003:
39	teenpornjoy.com	A	Error 9003:
40	video-porno.1lecheuse.com	A	Error 9003:
41	video-porno.videurdecouilles.com	A	Error 9002:
42	video-sex.femmesx.net	A	Error 9003:
43	video.freex.mobl	A	Error 9003:
44	videos-porno.x18xxx.com	A	Error 9003:
45	videos-sexe.1touffe.com	A	Error 9003:
46	videos-x.xpornogays.com	A	Error 9003:
47	videosanalesx.com	A	Error 9003:
48	videosfilleschaudes.com	A	Error 9003:
49	wifenaked.net	A	Error 9003:
50	ww.lastsexe.com	A	Error 9003:
51	www.10pointz.com	A	Error 9003:
52	www.69rueporno.com	A	Error 9002:
53	www.amateur-libertins.net	A	Error 9003:

54	www.anatarvasnavideos.com	A	Error 9003:
55	www.arabe-sexy.com	A	Error 9003:
56	www.arabebaise.com	A	Error 9003:
57	www.beauxcul.com	A	Error 9003:
58	www.beurettehot.net	A	Error 9003:
59	www.bigboty4free.com	A	Error 9003:
60	www.bizzzporno.com	A	Error 9003:
61	www.bomnporn.com	A	Error 9003:
62	www.boutique-sexy.ch	A	Error 9003:
63	www.bravioteens.com	A	Error 9003:
64	www.callboyindia.com	A	Error 9003:
65	www.cam4.in	A	Error 9003:
66	www.cleomture.com	A	Error 9003:
67	www.couleurivoire.com	A	Error 9003:
68	www.cullosgratis.com.ve	A	Error 9002:
69	www.daultpornvideox.com	A	Error 9003:
70	www.eroticteens.pw	A	Error 9003:
71	www.esseporn.com	A	Error 9003:
72	www.fapto.xxx	A	Error 9003:
73	www.femdomecpire.com	A	Error 9003:
74	www.fille-nue-video.com	A	Error 9003:
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76	www.film-xxx-black.com	A	Error 9003:
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78	www.freematurevideo.net	A	Error 9003:
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80	www.gobeurettes.com	A	Error 9003:
81	www.gokabyle.com	A	Error 9003:
82	www.guide-asie.com	A	Error 9003:
83	www.haporntube.com	A	Error 9003:
84	www.hornybook.com	A	Error 9002:
85	www.hot-gifz.com	A	Error 9003:
86	www.hotchicks.sexy	A	Error 9003:
87	www.hyat.mobi	A	Error 9003:
88	www.immaturewomen.com	A	Error 9003:

89	www.indiansgoanal.org	A	Error 9002:
90	www.ixxx.com.es	A	Error 9003:
91	www.jeunette18.com	A	Error 9003:
92	www.lechecallente.com	A	Error 9003:
93	www.les-groses.net	A	Error 9003:
94	www.lesbiennesxxx.com	A	Error 9003:
95	www.llveleak.com	A	Error 9003:
96	www.marocainenue.com	A	Error 9003:
97	www.masalopeblack.com	A	Error 9003:
98	www.mature-galleries.org	A	Error 9003:
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101	www.maturexxxclipz.com	A	Error 9003:
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110	www.ohasiatique.com	A	Error 9003:
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115	www.porn20.org	A	Error 9003:
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129	www.sexe-evbony.com	A	Error 9003:
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136	www.wethairywats.com	A	Error 9003:
137	www.xgouines.com	A	Error 9003:
138	www.xnxxgifs.com	A	Error 9003:
139	www.xxxmomclips.com	A	Error 9003:
140	www.zmilfs.com	A	Error 9002:
141	xxi.onxxille.com	A	Error 9003:
142	xxl.sexgratuits.com	A	Error 9003:

RTI (P)

To
The Public Information Officer,
Ministry of Electronics & Information Technology
RTI/PG Cell
Government of India

Subject: Providing information under RTI act for research purpose.

I need following information for my Ph.D. in the area of web content filtration of unsolicited content.

1. Kindly provide me a copy of existing policy to control unsolicited content (Obscenity, pornographic content) or web content filtration.

2. Kindly provide me a copy of regulation/ programme/ or any other activity of government of India in the said area.

3. Kindly provide me the detail in regard of mechanism/ roadmap / network architecture/ network framework to control unsolicited content.

It is humbly requested that if web links are available you're requested to send that. It will suffice my requirement. You can Email me also. Hardcopy information is not mandatory.

For the purpose the postal order number 35F 704406 of worth 10 rupees is being attached herewith. If there will be requirement of more money in this regard that will also be made available to you easily.

Declaration: The information sought from you in regard of above subject matter will be used only for research purpose.

Yours Sincerely

No. 1(4)/2018-RTI
Government of India
Ministry of Electronics & Information Technology
'Electronics Niketan', 6, CGO Complex
New Delhi-110003

Date : 27.04.2018

Subject: Transfer of Application under RTI Act, 2005 received from Shri Saurabh Pandey.

Please find enclosed an application received from Shri Saurabh Pandey dated NIL under RTI Act, 2005 (copy enclosed). The information sought in the application pertains to Cyber Security Division. The same is being transferred for further necessary action.

2. It is requested that the reply may be sent **directly to the applicant**. Fee of Rs.10/- has been received along with the application vide IPO No.35F 704406.

(Ashma Gandhi)
Deputy Director

To,

Shri Vinod Kumar Chauhan,
Scientist 'C' & CPIO
Cyber Security Division
MeitY

Encl: As above.

Copy to : Shri Saurabh Pandey, Producer Studio, Vardhman Mahaveer Open University, Kota, Rajasthan – 324010.

Speed Post

No. 12(1)/2018-CLES
Government of India
Ministry of Electronics & Information Technology
Cyber Law and Cyber Security Group

Electronics Niketan, 6, CGO Complex,
Lodhi Road, New Delhi - 110003

Dated 28.05.2018

Subject: Application under RTI Act, 2005 received from Shri Saurabh Pandey.

With reference to your RTI application related to information in the area of web content filtration of unsolicited content, it is hereby informed that Section 67, Section 67A and Section 67B of Information Technology Act has provisions of punishment for publishing or transmitting obscene material in electronic form, punishment for publishing or transmitting material containing sexually explicit act etc. in electronic form and punishment for publishing or transmitting material depicting children in sexually explicit act etc. in electronic form respectively. However, you may please refer Information Technology Act 2000 and its amendments available at http://meity.gov.in/content/cyber-laws and https://indiacode.nic.in/handle/123456789/1999?view_type=browse.

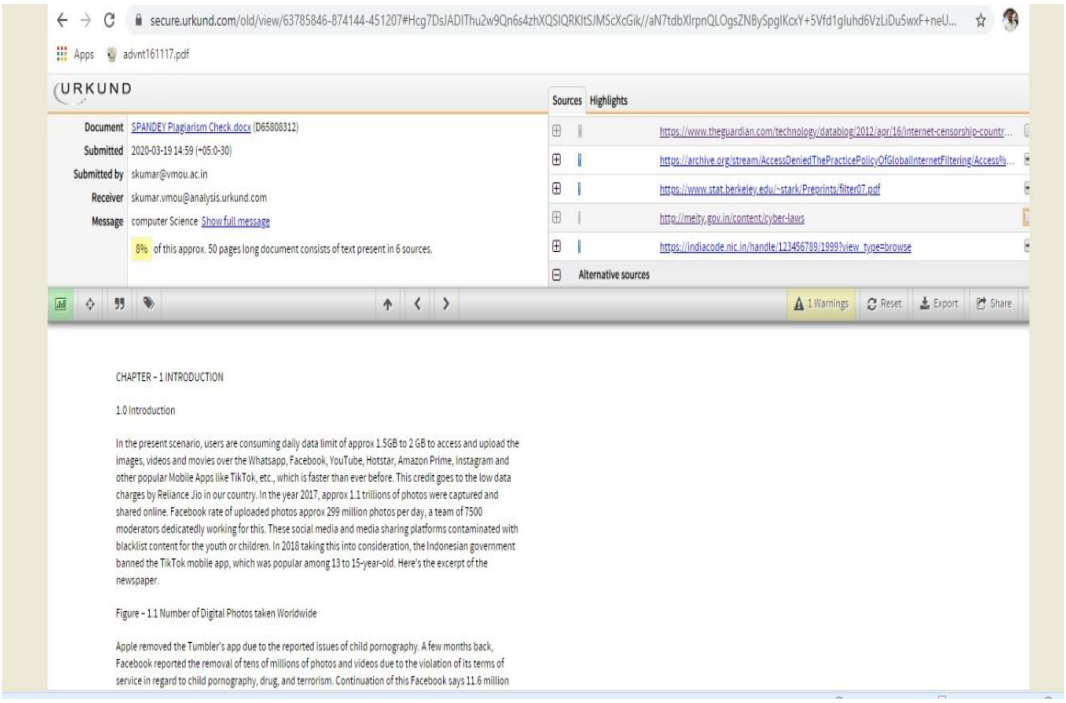
28/5/2018

(Vinod K Chouhan)
CPIO- CLES Group

To,

Shri Saurabh Pandey,
Producer Studio,
Vardhman Mahaveer Open University,
KOTA,
Rajasthan.
PIN : 324010.
MOBILE No. 9414024873.

Plagiarism Report (Q)



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EUROPEAN ACADEMIC RESEARCH
Vol. V, Issue 7/ October 2017

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Web content filtration (WCF) Techniques across the Globe: A Review

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Abstract:

Owing to the rapid change in technology, access of Internet is being common among all age groups across the globe but the accessed contents are associated with large amount of other unwanted material in different forms. These unwanted materials pose big challenges at personal and social levels. These unwanted materials are also a big challenge in terms of technical, legal and educational aspects. It is need of the hour to make information retrieval from the internet safe and credible (Willard, 2010). With the increase of obnoxious contents viz. violence, pornography, misconduct, mischief, suicide games etc. available on the internet, effective techniques and framework needed to inspect and block/ control unsolicited online content. An attempt has been made in present paper to review existing Web Content Filtration (WCF) techniques which are in practice around the world.

Key words: Filtration Techniques, Obscene Content, Web Content Filtration (WCF), Web Content category

INTRODUCTION

The saying ***"if you open the window for fresh air, you have to expect some flies to blow in"*** is perhaps a truth about

present IT revolution across the world. The media including images, videos including rhymes and educational videos, books, magazines, animations and video games are attracting children towards the internet in early ages. Educational institutions compel kids/ students to complete their project work/ assignment through internet. No one, including school educators, parents, and cyber experts have bothered about the dark side of the unwanted content available over internet, suicide video games for example blue whale game which caused several deaths, unsolicited and obscene contents over the web. On the other hand Internet has become a part of daily routine which is somehow affecting the every aspect of life. This is because it has become the electronic super highway where ones (every age group persons) information needs are satisfied. Internet has become a global communication medium and people of all age groups (kids - adults) to use it for their needs for computing, communication and more importantly reading, learning & teaching (Peddi Karthik, 2013). Unrestricted use of these contents is sufficient to derail kids / students / youths from the right path. The minds of immature children are mainly contaminated by these harmful games, fictitious and edited undesirable contents on internet which can be easily accessed over the web.

Prime Minister of England David Cameron announced a plan to filter online pornography by default for households in U. K., saying the initiative is about protecting children and their innocence (Peterson, 2013).

OBJECTIVES OF THE STUDY

It is well documented that watching the unsolicited content (pornographic content) has very adverse effect over the whole society especially to young mind. A research study led by scientists from the Gregorio Marañón University Hospital in Madrid and the Network of Centres for Biomedical Research in

Mental Health Networks (CIBERSAM) shows that adolescents experiencing a first outbreak of psychosis have lower levels of grey matter in their brains than healthy teenagers. This change was seen in patients suffering from various psychoses, including bipolar illness and schizophrenia. A study done by one of the well-regarded researchers in the field found that "high pornography consumption added significantly to the prediction of sexual aggression." (Kühn & Gallinat, 2014) It is also added that lack of grey matter in brain is linked to schizophrenia and bipolar disorders.

Considering the above, the research was planned with two fold objectives-

1) To review different categories of web content used for web content filtration (WCF)
2) To review different techniques of web content filtration (WCF) in practice

RATIONALE OF WEB CONTENT FILTRATION

It is unfortunate enough that at present there is no full proof mechanism to block/control all these unsolicited/unwanted contents immediately on the network level. In case of any communal anarchy, any rumour reaches to target people very fast which causes the immediate disturbance of peace.

On September 19, 2006, a military-led coup in Thailand overthrew the democratically elected government headed by Prime Minister *Thaksin Shinawatra*. Thailand is not unfamiliar with such upheavals. There have been seventeen coups in the past sixty years. This time, however, internet users noticed a marked increase in the number of web sites that were not accessible, including several sites critical on the military coup. A year earlier in Nepal, the king shut down the internet along with international telephone lines and cellular communication networks when he seized power from the parliament and prime minister. In Behrain, during the run-up

to the fall 2006 election, the government chose to block access to a number of key opposition sites. These events are part of a growing global trend. Claiming control of the internet has been come an essential element in any government strategy to rein in dissent – the twenty-first century parallel to taking over television and radio stations. In contrast to these exceptional events, the constant blocking of a swath of the internet has become part of the everyday political and cultural reality of many states. A growing number of countries are blocking access to pornography, led by a handful of states in the Persian Gulf region. Other countries, including South Korea and Pakistan, block web sites that are perceived as a threat to national security (Faris & Villeneuve, 2008, p.45).Indiscriminate Internet surfing is a major cause of entry for viruses, worms, Trojans, spyware, keyloggers, phishing, pharming and more. Notwithstanding there are essentially three motives or rationales for internet filtering: political filtering, social filtering and security/ conflict filtering.

Therefore, a robust and powerful network architecture plan and different kind of system algorithms (Network Level, Session Level, Application Level etc) is required to detect and control/block/monitor unsolicited/ unwanted contents over the web. Once any kind of network architecture & algorithms will be implemented, it can control/block/monitor any kind of specific content in a particular geographic area as and when needed. Therefore, a much more intelligent system equipped with different level of control is required to avoid the aforesaid shortcoming of present web content filtration (WCF) mechanisms.

The following diagram expresses the motives of present Web Content Filtration practices.

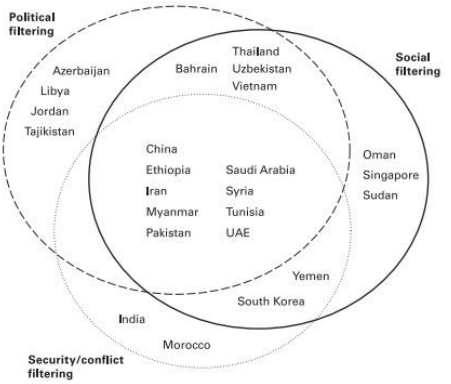

Figure 1 (Motives of Content Filtering)
(Source: Zittrain & Palfrey, 2008 p.26)

EXISTING WEB CONTENT FILTRATION (WCF) CATEGORIES

Web filter categories database are upon the web content viewing suitability of three major groups enterprises, schools, and home/families. The categories are defined to be easily manageable and patterned to industry and home user standards. All the service providers maintain their own content category data base to filter the web content.

Each category contains the list of websites or web pages that have been assigned based on their dominant web content. A website or webpage is categorized into a specific category that is likely to be blocked according to its content. When a website contains elements in different categories, web pages on the site are separately categorized. All the present available solutions regarding the web content have their own database of the websites and their categories. The following best web filtration categories (Fortinet, 2016) are given as below -

ADULT / MATURE CONTENT CATEGORY

Alcohol	Websites which legally promote or sell alcohol products and accessories
Dating	Websites that allow individuals to make contact and communicate with

	each other over the Internet, usually with the objective of developing a personal, romantic, or sexual relationship.
Gambling	Sites that cater to gambling activities such as betting, lotteries, casinos, including gaming information, instruction, and statistics.
And More	Abortion, Advocacy Organizations, Alternative Beliefs, Lingerie and Swimsuit, Marijuana, Nudity and Risqué, Other Adult Materials, Pornography, Sex Education, Sports Hunting and War Games, Tobacco, Weapons (Sales)

BANDWIDTH CONSUMING CATEGORY

File Sharing and Storage	Websites that permit users to utilize Internet servers to store personal files or for sharing, such as with photos.
Freeware and Software Downloads	Sites whose primary function is to provide freeware and software downloads. Cell phone ringtones/images/games, computer software updates for free downloads are all included in this category.
Internet Radio and TV	Websites that broadcast radio or TV communications over the Internet.
And More	Telephony, Peer-to-peer File Sharing, Streaming Media and Download

GENERAL INTEREST – BUSINESS CATEGORY

Armed Forces	Websites related to organized military and armed forces, excluding civil and extreme military organizations.
Charitable Organizations	Sites for organizations that are set up with a mission that serves a public purpose, and are philanthropic in nature. This category excludes advocacy or political organizations.
Finance and Banking	Financial Data and Services -- Sites that offer news and quotations on stocks, bonds, and other investment vehicles, investment advice, but not online trading. Includes banks, credit unions, credit cards, and insurance. Mortgage/insurance brokers apply here as opposed to Brokerage and Trading.
And More	General Organizations, Business, Government and Legal Organizations, Information Technology, Information and Computer Security, Online Meeting, Remote Access, Search Engines and Portals, Secure Websites, Web Analytics, Web Hosting, Web-based Applications

GENERAL INTEREST – PERSONAL CATEGORY

Advertising	Sites that provide advertising graphics or other ad content files, including ad servers (domain name often with 'ad.', such as ad.yahoo.com). If a site is mainly for online transactions, it is

	rated as Shopping and Auctions. Includes pay-to-surf and affiliated advertising programs.
Arts and Culture	Websites that cater to fine arts, cultural behaviours and backgrounds including conventions, artwork and paintings, music, languages, customs, etc. Also includes institutions such as museums, libraries and historic sites. Sites that promote historical, cultural heritage of certain area, but not purposely promoting travel.
Auction	Websites that feature on-line promotion or sale of general goods and services such as electronics, flowers, jewellery, music, etc, excluding real estate. Also includes on-line auction services such as eBay, Amazon, Priceline.
And More	Brokerage and Trading, Child Education, Content Servers, Digital Postcards, Domain Parking, Dynamic Content, Education, Entertainment, Folklore, Games, Global Religion, Health and Wellness, Instant Messaging, Job Search, Meaningless Content, Medicine, News and Media, Newsgroups and Message Boards, Personal Privacy, Personal Vehicles, Personal Websites and Blogs, Political Organizations, Real Estate, Reference, Restaurant and Dining, Shopping, Social Networking, Society and Lifestyles, Sports, Travel, Web Chat, Web Chat, Web-based Email

POTENTIALLY LIABLE CATEGORY

Drug Abuse	Websites that feature information on illegal drug activities including: drug promotion, preparation, cultivation, trafficking, distribution, solicitation, etc.
Child Abuse	Websites that have been verified by the Internet Watch Foundation to contain or distribute images of non-adult children that are depicted in a state of abuse. Information on the Internet Watch Foundation is available at http://www.iwf.org.uk/.
Extremist Groups	Sites that feature radical militia groups or movements with aggressive anti-government convictions or beliefs.
Hacking	Websites that depict illicit activities surrounding the unauthorized modification or access to programs, computers, equipment and websites.
And More	Illegal or Unethical, Plagiarism, Proxy Avoidance, Explicit Violence

SECURITY RISK CATEGORY

Dynamic DNS	Sites that utilize dynamic DNS services to map a Fully Qualified Domain Name (FQDN) to a specific IP address or set of addresses under the control of the site owner; these are often used in cyber attacks and botnet command & control servers.

Phishing	Counterfeit web pages that duplicate legitimate business web pages for the purpose of eliciting financial, personal or other private information from the users.
Spam URLs	Websites or webpages whose URLs are found in spam emails. These webpages often advertise sex sites, fraudulent wares, and other potentially offensive materials.
And More	Malicious Websites, Newly Observed Domain, Newly Registered Domain

COMMONLY USED TECHNIQUES FOR INTERNET FILTRATION

There are many techniques used to filter the internet content. All the techniques are designed to use at certain levels of network architecture. Internet filtering is most commonly implemented at two levels: At the ISP's level – This type of filtration is being implemented by Internet Service Providers (ISPs) at ISP level on the recommendation of the Government and at the international gateway level – This type of filtration is being implemented at the international gateway where the internet traffic of the entire ISP's routed. The uniform and unique filtration achieved at this level across the different ISP's. In the following paragraphs existing techniques for internet filtration have been discussed briefly:

1. **Packet Level Filtering** – TCP/IP Filtering works mainly at network layer to inspect the information packets including source IP address, source port, destination IP address, destination port and the protocol used. Based on the packet and rules the packet may be dropped or granted and may forward the information to network administrator. It is used at the router level as an additional security layer. To start with the network security, the packet level filtering is the way to proceed. This functionality is still the main aim of most of the non-commercial and commercial security tools. Therefore, if anything comes to internal network, it passes through the network security filters. Any type of

outgoing content will also pass through the security filters/security walls before leaving the network completely. Due to this property, the packet level filtering is also called as screening level filtering. The bigger problem with packet level filtering is that it can be hacked easily by a hacker using spoofing process.

2. **Circuit Level Filtering -** Circuit level filtering is another type of security wall which works at the session layer through providing a more general type of security. Circuit level filtering acts as relay for TCP connections. They interrupt TCP links which are being made to a host behind them and complete the handshake on behalf of that host and determine the authenticity of a requested assembly by monitoring the handshake between packets. The circuit level filter is able to hide the outside network. It also restricts the network rules to known computers. Usually, circuit level filter are economical than other protective filters. The main disadvantage of this type of filter is that every packet cannot be detected due to more general things in contemplation of filtering the packets.

3. **Application Level Filtering** – Application level filtering refers to vulnerabilities inherent in the code of a web-application itself (irrespective of the technologies in which it is implemented or the security of the web-server / back-end database on which it is built) (Scott & Sharp, 2003). Application level filtering is demanding and most secure type filtering. But it has lengthy cost of process. Because in this type of filtration, at every filtration layer new session of process starts. This type of filtering works at the application layer and is protocol specific. It is also called as proxy filtering.

4. **IP Blocking** – Internet Protocol blocking is a security filtering that stops transfer of protocols between two or more targets or servers. This type of filtration is applied to block undesirable or unwanted sites and hosts which hack, postpone or harm the network or machine. IP blocking is mainly used by the industries or companies for preventing the invasion of viruses or harmful software or data. It limits the range of websites that are accessed by the persons for official purposes. Educational institutions also use IP blocking type of filtration to protect against unauthorised access of confidential data. Ferguson and Senie (1998) observed that a rebirth of rejection of service attack aimed at various targets in the networking have produced new challenges. While blocking any IP address, all the shared hosted websites associated with that IP gets blocked by default which misleads the main objectives.

5. **DNS Tampering** – The Domain Name System (DNS) is an essential part of the Internet. The primary purpose of DNS is to resolve symbolic domain names to IP addresses (Son & Shmatikov, 2010, p.466). Each DNS resolver or authoritative server stores Resource Records in its cache or its local zone file. A Resource Record (RR) includes a label, class, type and data. The label of an RR is a symbolic domain name used when accessing an internet resource (Khan, 2015). DNS tempering is achieved by purposefully disrupting DNS servers, which resolve domain name into IP addresses. To block access to a particular website, the DNS servers are configured to return the wrong IP address. While this allows the blocking of specific domain names, it also can be easily circumvented by simple means such as accessing an IP address directly or by configuring the computer to use a different DNS server (Deibert, *et. al.*, 2008, p.14).

6. **HTTP Proxy Filtering** – HyperText Transport Protocol (HTTP) is the protocol through which Web pages travel. Another method of filtering involves using *proxy servers* or *Web proxies*, which analyse and possibly modify HTTP content as it travels between computers and the Internet. To implement HTTP filtering, Web traffic must be redirected to travel through the proxy server (Scott & Melgosa, 2013, p.56). It is an alternative way to not allow users to connect directly to website but force or encourage all users to access Web sites via a proxy server. However, as well as improving performance, an HTTP proxy can also block Web sites. The proxy decides whether requests for Web pages should be permitted, and if so, it sends the request to the Web server hosting the requested content (Murdoch & Anderson, 2008, pp.61-62).

7. **Browser Based Filtering** – Content Filtering is new subject in the area of technology. That has to study in deep. This issue appears as consequences for the variety of media and advertisement in the internet web sites that lead to unethical and misuse of World Wide Web users (Karthikeyan, 2014, p.203). In which browser based content filtering solution is the most lightweight solution to do the content filtering, and is implemented via a third party browser extension (Karthikeyan, 2014, p.204). The browser based filtration is performed through add-ons, approving a website with digital certification or enabling custom parental controls individually. Pixel based algorithms to identify the obscene content is highly used in browser based filtering.

DISCUSSION & CONCLUSION

The key feature in a web content filtration (WCF) solution is a high level of "granularity". The term "granularity" refers the degree of best possible database match of the accessed content in right category and criteria. For example, one may want to allow access to Facebook page to branding team but not provide ones employees access to facebook chat. Content filtration system works on the principle of blacklists and white lists category filters. Backlists are lists of websites/ IP/ URL's in database that contain inappropriate materials. White lists are the list of websites/IP/ URL's in database one want to allow to open.

The best filtering results can be achieved by perfect balance between the over breadth and under breadth issues. Because the primary deficiency of any web content filtration (WCF) system is that the censor must choose between two shortcomings: either the system suffers from over breadth (websites that are not meant to be filtered are filtered) or under breadth (not all web sites meant to be filtered are filtered) issues or combination of both (Zittrain & Palfrey, 2008, p.45)

In nut shell Web Content Filtration (WCF) techniques are evolving rapidly. Different countries are opting different techniques as per their need and requirement. It can also be derived that no single technique may be utilized for Web Content Filtration (WCF) of unwanted contents. So, it is recommended that efforts should be made to develop some mechanism which may utilize the hybrid combination of best optimized techniques with a high level of "granularity".

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IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Vol.-7, Issue-6, June 2019 E-ISSN: 2347-2693

Blocking Mechanism of Porn Website in India: Claim and Truth

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DOI: https://doi.org/10.26438/ijcse/v7i6.417428 | Available online at: www.ijcseonline.org

Accepted: 13/Jun/2019, Published: 30/Jun/2019

***Abstract*-** In last few years, the addiction of internet is apparently recognized as the serious threat to the health of society. This internet addiction gives an impetus to pornographic addiction because most of the pornographic content is accessible through internet. There have been ethical concerns on blocking the contents over internet. In India Uttarakhand High court has taken initiative for the blocking of pornographic content over internet. Technocrats are coming up with various innovative mechanisms to block the content over internet with various techniques. All though long ago in 2015, the Supreme Court of India has already asked to block some of the websites but it could not be materialized. The focus of this research paper is to review the effectiveness of existing web content blocking mechanism of pornographic websites in Indian context.

***Keywords*:** Pornographic Content, Website Blocking, Blocking Mechanism, Filtering, Error code, Status code

I. INTRODUCTION

The study on the effectiveness of the blocking mechanism is crucial in knowing the current practices used for the blocking the websites in India. The report released by Kantar IMRB ICUBE 2018 reveals, that internet user base in India has crossed 500 million watermarks and is about to reach 627 million by the end of 2019. The number of internet users is suppose to be 566 million as of December 2018, registering annual growth of 18% (Pti., 2019).

The rapid growth of internet users in India has made it a country prone to abuses of internet too. Kids as well as adults are gradually becoming more addictive to internet in general and unsolicited content available over internet in particular, creating a worry to the nation to block unsolicited content available over the internet to save Indian socio-cultured structure and innocence of kids. Stride efforts has been being made by Government of India (GOI) to block or restrict open access of such unsolicited content. The following diagram presents the comparative growth of internet users since last three decades in India and China.

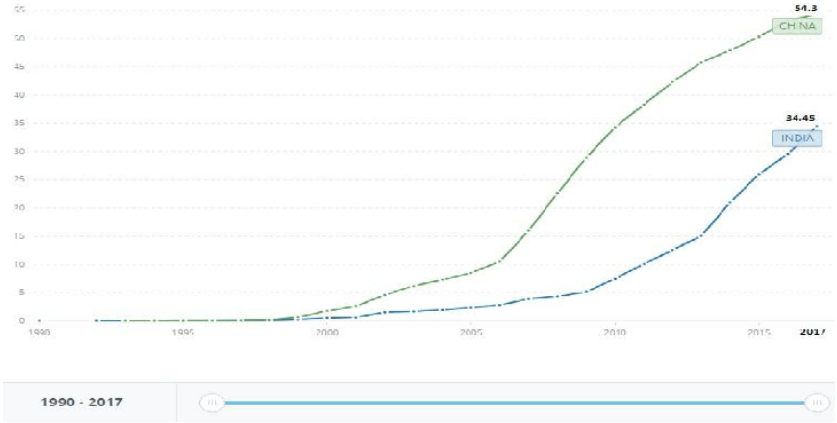

Figure – 1 Internet users in India 34.4% of the population (2017)

Sources:https://data.worldbank.org/indicator/IT.NET.USER.ZS?contextual=default&end=2017&locations=IN-CN&start=1990&view=chart

In one of its decision, Uttarakhand High Court states "Unlimited access to these pornographic sites is required to be blocked / curbed to avoid adverse influence on the impressionable mind of the children". The court also directed the GOI to suspend the licences of internet service providers, under Section 25 of the Information Technology Act, 2000, if they don't comply with the notification of July 31, 2015. The notification listed over more than 800 websites and directed internet service providers to block access to them as the contents posted on these websites "infringed morality and decency" (Santoshi, 2018).

The minutes of the Cyber Regulation Advisory Committee meeting held on 5th September, 2014 in DietY. Secretary, Department of Information and Technology (DOIT) informed that blocking of websites has been implemented through ISPs immediately when orders were received for blocking. The infrastructures at ISPs need to be upgraded to deal with such large number of web sites for blocking.

II. REVIEW OF RELATED LITERATURE

At present, the government delegates the censorship of internet traffic through ISPs. As per the present data & facts of blocking mechanism of websites is not much encouraging then how the government might enforce a unified censorship policy for the whole county in future (Gosain *et al*., 2018).

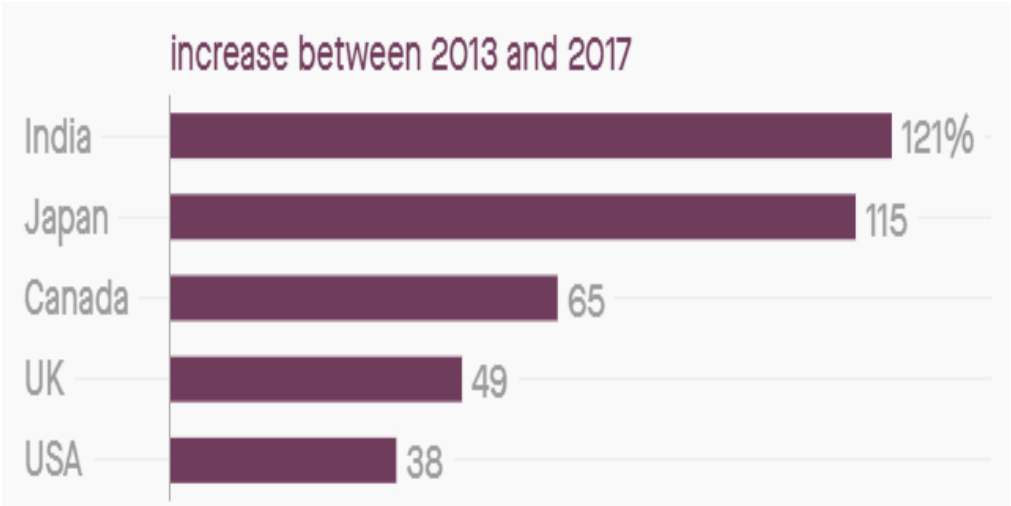

Figure – 2 Growth of mobile traffic share in Pornhub's top five markets

Source: Pornhub (https://www.theatlas.com/charts/HkJBO-PHG)

The viewing of adult content soared 75% since data rates came crashing down in the second half of last fiscal 2016 under severe competitive pressure, according to video viewership tracker Vidooly's findings, available exclusively with ET Telecom.com from the Economic Times. The new entrant Reliance Jio's aggressive pricing forced incumbents Bharti Airtel, Vodafone, and Idea Cellular to slash down data rates, even as porn viewing surged - primarily in the tier 2 and tier 3 towns. It is more interesting to note that about 80% of the web content is in short form, and tier 2 and 3 towns contribute 60% of total viewership

At one side research findings support the positive correlation between video consumption and its impact on brain to learn and remember things very quickly while the other side there is open internet for all age groups with the factious visuals. At present scenario, it would be the matter of big importance to differentiate between the reality of visual content against the fake and fictions ones.

Studies related to trends in pornography preferences, Pornhub reports on the device types used by its customers. Its 2018 report has shown that customers are increasingly enjoying their porn material on the go using their mobile phones. In 2013, only 40% of Pornhub's traffic was on a phone; which increased to 67% in 2017 (Kopf & Kopf 2018).

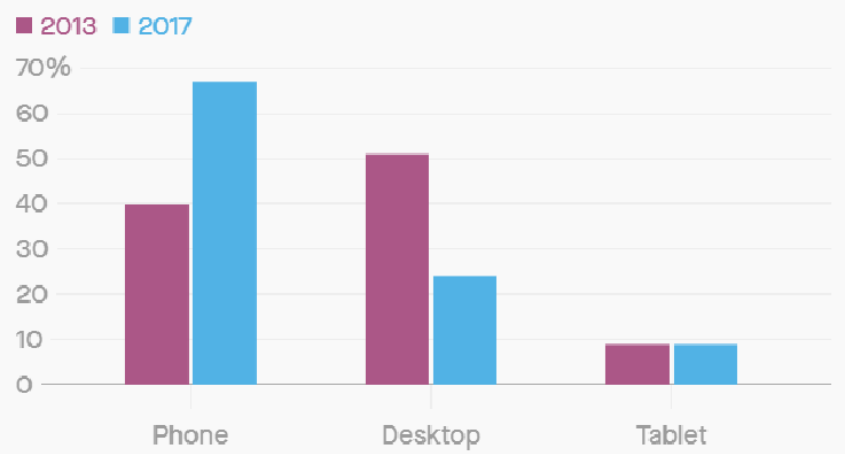

Figure – 3 the trend of porn users moving to mobile devices
Source: Pornhub (https://www.theatlas.com/charts/BJBi_GNBM)

In recent years, internet addiction has become more prevalent worldwide and its adverse impact on the health of the society is also not invisible. Hou *et al*., (2012) has conducted his study titled "Reduced Striate Dopamine Transporters in People with Internet Addiction Disorder". The study revealed that internet addiction may induce significant Dopamine transporter losses in the brain and findings suggested that internet addiction is associated with dysfunctions in the dopaminergic brain systems. The findings also supported the claim that internet addiction may share similar neurobiological abnormalities with other addictive disorders.

Alarcón *et al*., (2019) have conducted a review on "Online Porn Addiction: What We Know and What We Don't". Authors concluded that pornography addiction is a type of hypersexual disorder and may be composed of several sexual behaviors, such as problematic use of online pornography (POPU). They further identified that online pornography use is on the rise, with a potential for addiction and this problematic use has adverse effects in sexual development and sexual functioning, particularly among the young population.

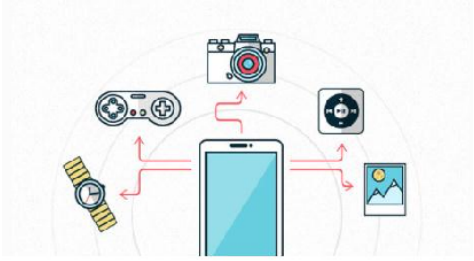

Figure – 4 How the Internet of things is changing the World around us
Source: https://www.netsolutions.com/insights/how-the-internet-of-things-is-changing-the-world-around-us/

In Oct. 2018, the Indian government's telecom department communicated internet service providers (ISPs) to ban 827 websites for hosting pornographic content. (Singh & Singh 2018) reported that this is the second attempt in recent times by India, among the most prolific consumers of porn watching, to shut it out. In August 2015, following a Supreme Court verdict, the government had unsuccessfully tried to block about 857 websites on the grounds that such content promotes sexual assault. Further the Uttarakhand high court has reinstated the Supreme Court's ban after a rape accused in the state's capital Dehradun said third person the culprit was nudged into committing the crime after watching a porn movie (Singh & Singh 2018).
A few years back, various websites were blocked in totality by service providers when they were only directed to block a particular webpage. The logic and rationale given by these providers was that since they lacked the intrinsic mechanism to block a webpage, they blocked the entire website.

As of now whatever are discussed were focused on abuses of internet but can be very effective if used properly for example as far as teaching and learning process is concerned watching the educational videos may be the best way to improve learning, especially when it comes to remembering key facts and figures. In fact, according to Dr. James McQuivey of Forrester Research, one minute of online video equates to approximately 1.8 million written words. In addition to this, 90% of information transmitted to the brain is visual, and visuals are processed 60,000 times faster in the brain than text. This indicates visual education aids like video can improve learning and increase the rate at which one retains the information.

There are sufficient proofs that teaching online educational videos available on *YouTube* or any other platform is facilitating the teaching and learning process. The teachers and the student both get benefited from this. The study conducted by Elyas & Kabooha, entitled "The Impacts of Using *YouTube* Videos on Learning Vocabulary in Saudi EFL classrooms" indicates that videos on you tube is making teaching and learning process attractive, interesting and enjoyable. These videos plays crucial role in motivating students intrinsically and as well as extrinsically. Alwehaibi (2015) concluded in his research that the use of *YouTube* platform resulted in reading, writing, analyzing, interacting seeking part in different activities throughout the learning cycle.

The study conducted by FSG organization a statewide pilot of Khan Academy in Idaho with 173 teachers and 10,500 students during the 2013-14 school year shows that students who complete 60% of their grade-level math on Khan Academy experience 1.8 times their expected growth on the Northwest Evaluation Association (NWEA) Measures of Academic Progress (MAP) test, which is a popular achievement of mathematics (Phillips *et al*., 2013-2014)

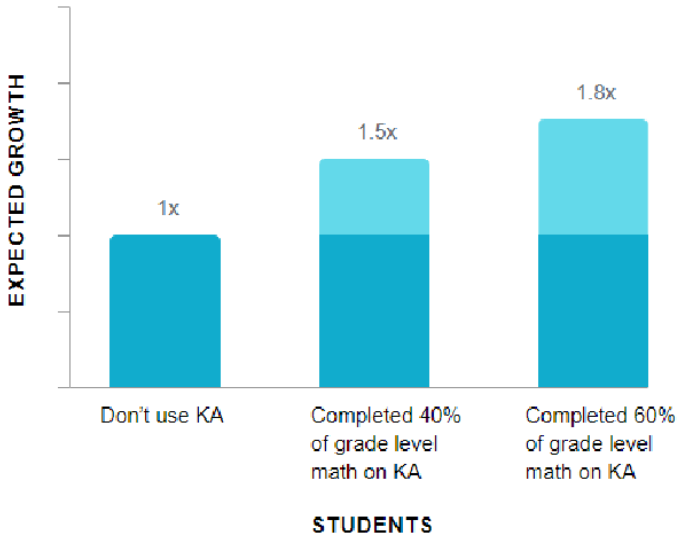

Figure – 5 Impact of Khan Academy on the level of achievement of Mathematics
Source: https://www.khanacademy.org/about/impact

III. METHODOLOGY

Source: https://www.khanacademy.org/about/impact

In the present study the following objectives were under taken O1: O2:

O1: To review the present blocking mechanism used for blocking the websites in India

Q2: To identify and analyze the Architecture of the present blocking mechanism used for blocking websites in India

In order to estimate the status of the blocked websites, the status of all the websites banned by the department of information and technology in respect of the HTTP Error Codes/ Status Codes were investigated. Using HEADMasterSEO tools 849 blocked websites were evaluated. The top four broad categories of the websites on the basis of the further higher number of counts for HTTP error code/ status code responses (200, 301, and 302, blank) were identified. The HTTP status codes indicated

whether a specific HTTP request has been successfully completed or not. Every HTTP request that is received by a server is responded with an HTTP status code. HTTP status codes consist of three digit codes and grouped in different classes. The class of status code identified by its first digit of the status code responses –
1xx: Informational
2xx: Success

Table – 1 Description of Error Code/ Status Code 200

Error Code / Status Code	Message	Description
200	OK	This code indicates that server successfully processed the request and in response provided the requested page.

3xx: Redirection

Table – 2 Description of Error Code/ Status Code 301, 302

Error Code / Status Code	Message	Description
301	Moved Permanently	This code refers that the requested page permanently moved to a different location. It means server forwards the user request to the new associated location.
302	Found / Moved Temporarily	This code refers that presently server is catering the user request from the different location, but in future the user request may be catered from the previous or original location.

4xx: Client Error

5xx: Server Error

Table - 3 An overview of Technical Status of blocked websites in India based on Error Codes

Error Code Description	Error Codes							No of URL
Row Labels	200	301	302	307	403	404	(blank)	Grand Total
Forbidden					3			3
Found			43					43
Found : Moved Temporarily			1					1
Found, Redirect Loop			3					3
Invalid Server Response							10	10
Moved Permanently		186						186
Moved Temporarily			6					6
Name Not Resolved							137	137
Not Found						4		4
OK	449							449
Redirect			2					2
Temporary Redirect				4				4
Timeout							1	1
Grand Total	449	186	55	4	3	4	148	849

Table - 4 Top Four Broad Categories of Websites based on Error Codes					
	Error Codes				No of URL's
Description : Error Code	200	301	302	0 (blank)	Grand Total
Found			43		43
Moved Permanently		186			186
Name Not Resolved				137	137
OK	449				449
Grand Total	449	186	43	137	815

Sample and Sampling

In this study 262 porn websites were selected as sample through proportionate stratified random sampling method. The sample size was determined using formula for determination of sample size for known population (Cochran, 1963, p. 75).

Sample size for population $$\frac{n_0 = z^2 * P(1-P)}{e^2}$$ Equation 1

Where

n_0 = Initial sample size

z = Selected critical values of desired level of confidence or risk from (Z-table) 90% (1.645), 95% (1.96), 99% (2.576)

P = Estimated proportion of an attribute that is present in the population of maximum variability of the population Maximum Variability (50%) that is (0.5)

e = Desired level of precision or margin of error (+- 5%) that is (0.05)

Now putting the values in formula

$$\frac{n_0 = 1.96^2 * 0.5(1-0.5)}{(0.05)^2}$$

$$= 384.16 = 384$$

Now calculate population correction factor for sample size for known population –

$$n = \frac{n_0 N}{n_0 + (N-1)}$$ Equation 2

Where

n = Sample size for known population

n_0 = Initial sample size for population

N = Known population

$$n = \frac{384 * 815}{384 + 814}$$

$$= \frac{312960}{1198}$$

$$= 261.23 = 261$$

Sample size of the strata = $\frac{Size\ of\ entire\ sample}{population\ size\ *\ layer\ size}$ Equation 3

Now putting the values in formula

Table – 5 Sample Description

Strata	Known Population	Calculations	Sample
200	449	$\frac{261}{815 * 449} = 143.79 = 144$	144
301	186	$\frac{261}{815 * 186} = 59.56 = 60$	60
0	137	$\frac{261}{815 * 137} = 43.87 = 44$	44
302	43	$\frac{261}{815 * 43} = 13.77 = 14$	14
			262

IV. EXPERIMENTAL RESULTS: ANALYSIS AND DISCUSSION

When attempt were made to access the blocked website / URL's to use of the tools (tor browser and opera browser with virtual private network (VPN) facility) which uses the different ports and protocol of the Open System Interconnection (OSI) model for the communication to serve the user request. The end results were very awaking that more than 95% of the website in each strata were successfully browsed with these tools and technology except the HTTP 0/Blank error codes/ status codes (Name Not Resolved) websites. Name Not Resolved means that the hostname/ website you are trying to connect cannot be resolved to an IP address (Hostname/ website name resolved to IP addresses by a Domain Name Server system).

Table - 6 Tor Browser Success %

Error Code	Description	Tor Browser Success %
302	Found	96
301	Moved Permanently	98
200	OK	99

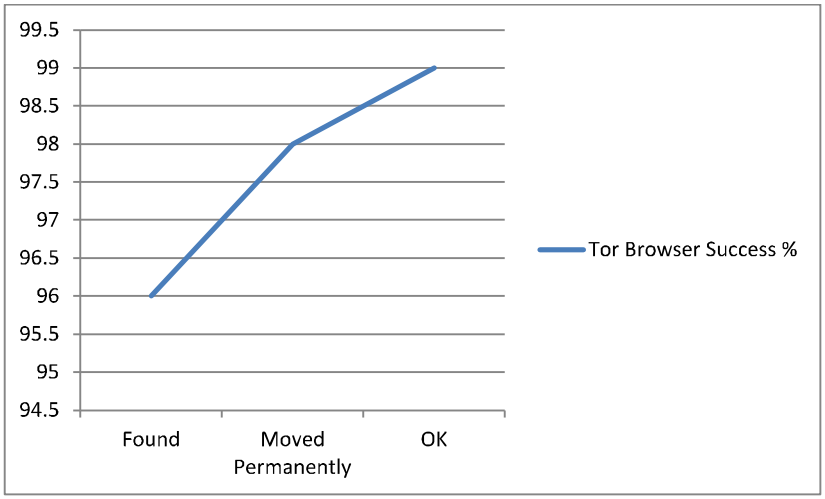

Figure - 6 Tor Browser Success %

Table 6 and Figure 6 represents that porn websites across different category of error codes/ response codes (302, 301 and 200), are brows able with Tor browser at the success rate of more than 96%.

Table - 7 Opera Browser (VPN) Success %

Error Code	Description	Opera Browser (VPN) Success %
302	Found	97
301	Moved Permanently	96
200	OK	98

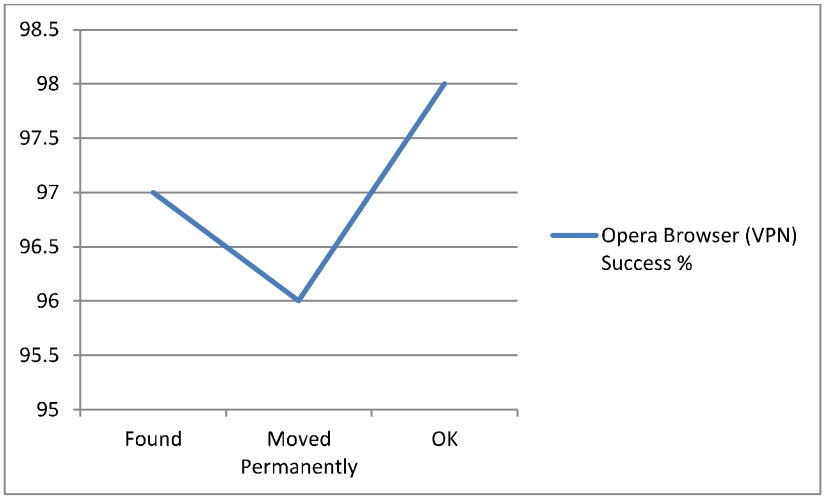

Figure 7 Opera Browser (VPN) Success in percentage

Table 7 and Figure 7 represent that porn websites under the category of error code/ response code (302, 301 and 200) are brows able with Opera browser at the success rate of more than 96%.

Table - 8 Comparison of Tor Browser & Opera Browser (VPN) Success %			
Error Code	Description	Tor Browser Success %	Opera Browser (VPN) Success %
302	Found	96	97
301	Moved Permanently	98	96
200	OK	99	98

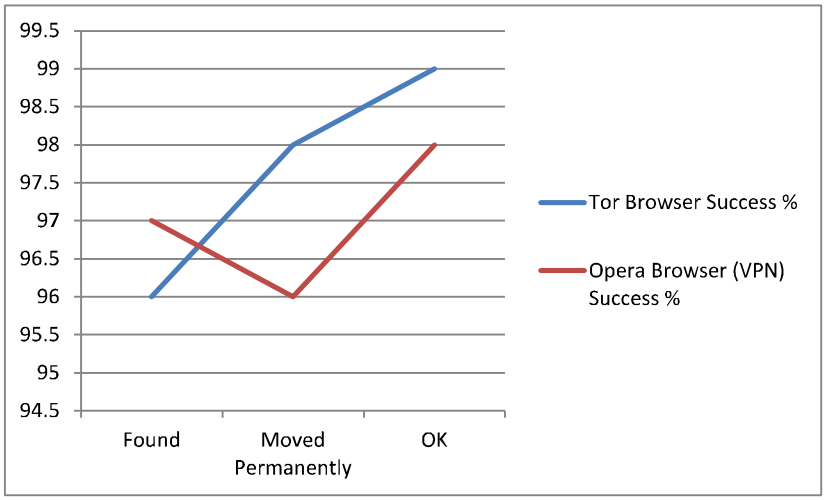

Figure - 8 Comparison of Tor Browser & Opera Browser (VPN) Success in percentage

Table 8 and Figure 8 indicate that more than 95% of the websites were selected as sample is easily accessible with the help of these browsers.

Table - 9 Status of Websites with Blank Error Codes	
Status of websites with blank error codes	No. of Domains
Domain Name Available for Purchase	24
A Records Not Found	21
Total No of Websites	45

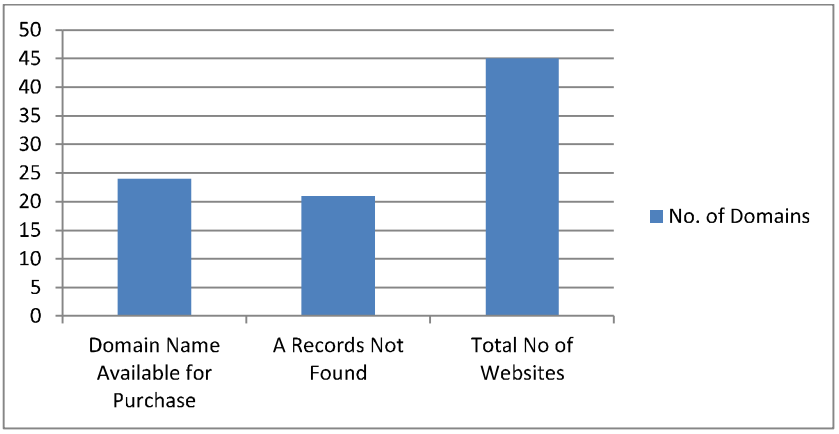

Figure – 9 Status of Website with Blank Error Codes

Table 9 and Figure 9 show the status of the domain name of the websites for the bank error codes. Out of 45 websites in this category 24 domain names available for purchase for this testing, were used the godaddy bulk domain check web utility Register Domains in bulk at GoDaddy. 21 domain names of websites existed but not mapped with any A records for this testing we have used the infobyip.com web utility page ipbulklookup.php (InfoByIP.com.).

Findings - The testing results reveals that the DNS based content blocking mechanisms are being used by the ISP's in India. Website's blocking has been done in continuation to the blocking orders & list released from the department of information and technology (DOIT) in compliance of the order to ban websites by Uttarakhand High Court. This type of filtering mechanism caters the user DNS requests, either by dropping the request or by responding the misleading IP responses by the DNS. Although, in India there are approx 50000 DNS servers, distributed across different networks, reconfiguring all such servers to filter DNS queries for black-listed sites would not be easy (Gosain *et al.*, 2018). DNS based content blocking does not filter and examine all network traffic; instead, it focuses on controlling and routing of DNS queries to bogus IP's.

Discussion on Findings – Checking of the status of the A records for the blocked websites in India and from the US locations through the help of the online utility available at InfoByIP.com, revealed the same A records values from both the locations. Further when it was tried to access the banned website in India, it routes the request and finally got the block page of the website with the text message (Web Page Blocked! The page you have requested has been blocked, because the URL is banned as per the Government Rules) and the meanwhile when accessed the same website with United States hosted server it lead to the final destination of the website without any block page message because there is no any restriction in United States for these websites. As per these testing and comparison of the results for two different geographical locations lookup results for A records have been found same. End result indicated that for the same public IP (A public IP address is the globally unique IP address assigned to any device)

one is getting two different page responses due to the DNS based content blocking in India. In the United States the web request with the same IP lead to the actual destination of the web page while in India it routes to the blocked page hosted / routed by the various ISP's in India.

So on the bases of above experimental results one can easily interpret that the ISP's of India often uses the DNS based content blocking mechanism to block the websites in India.

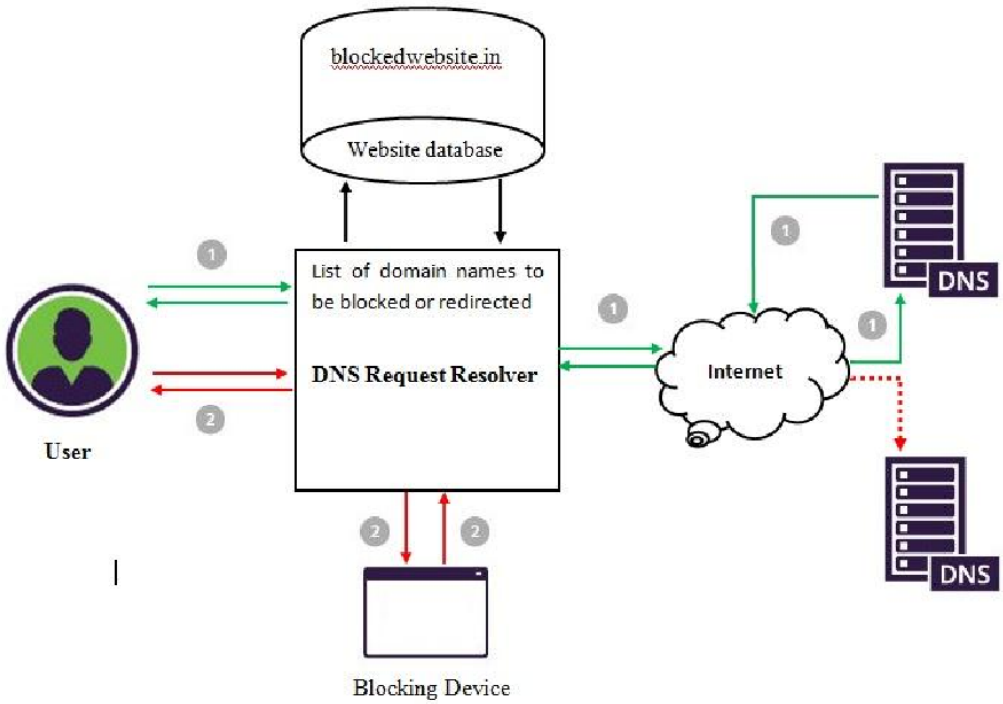

Figure - 10 Architecture of DNS-Based Websites Blocking Mechanism

1 → User initiates the request for website i.e. www.allowwebsite.in The allowwebsite.in is not in the list of blocked domain names. User request forwarded to the DNS server for allowwebsite.in with the query what is the IP address of allowwebsite.in

1 ← DNS server for allowwebsite.in resolves the request and in response send the IP address of allowwebsite.in=W.X.Y.Z to the user. The DNS query operate normally and returned the correct answer

2 → User initiates the request for website i.e. blockedwebsite.in The blockedwebsite.in lies in the database of blocked website list. In this case the user request will not forwarded to the DNS server

The DNS query for blockwebsite.in intercepted by the blocking device which returns the IP address of the webserver. Webserver returns the error page "Website Blocked" because the blockwebsite.in on the block list

CONCLUSION

The present website blocking mechanism of Government of India seems in effective. It needs to address the issues with long lasting corrective measures. In fact present blocking mechanism is not sustainable to achieve its goals at grass root level. The blocking mechanism used by the ISP's is low cost and can be quickly implemented, but the major flaw is that there is no blocking mechanism at different layers and ports of the OSI / TCPIP model. It is not holistic solution to block the request for the unwanted sites at different levels. It was observed that the blocked websites are easily accessible with the help of the browsers, using the different protocols and ports of communication. There are numerous pornographic websites available on internet so it does not seem practical to block it with the help of ISP's using DNS based blocking only. India has to think of an integrated holistic model for web content filtering and blocking.

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