

Evaluation of Internet Generations on Wireless Network: A Survey

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ABSTRACT

In the recent era, the demand of the internet is increasing. The Internet is global computer network that provide the sharing of data and information. Internet is useful in every field. It modifies the way of working, living style and contributed positive impact on our life. With the raising of the demand new tools and technologies are developed. The internet is classified in various generations depends on the functionality and key features. In this paper the generations of the internet and functionality are discussed. The internet has 1.0, 2.0, and 3.0 that provides internet protocols. Internet 4.0 and 5.0 are grownup and it works on wireless and sensor network devices. With the development of new generation the data rate, flexibility, Quality of service, performance and many other features are improved. In this survey focus on the features, techniques and tools provided by each generation.

1. Introduction

The internet comes from the word combination of networks. In the Internet millions of computer networks connect for exchanges data & provide knowledge. Internet protocols set of rules that provide security features (Keswani, Keswani & Purohit, 2020). The internet is designed for thousands of computers are laboring for sharing information. Fortunately, researchers, scientist and even engineers need the new technologies, protocols and standards (Bonnaud, 2020). For taking advantages next and new internet generation are generates and it offers efficient, affordable, valid, secure data information and deliver it to proper destination at the thousands of times faster than previous generation (Niraja & Rao, 2020).

Internet was developed near about 50 years ago. In these earlier years we learn about many new technologies, networking and flow of packets (Tian & Li, 2001; Roman, Zhou & Lopez, 2013). The one of the motive of internet is generate a advance technology which is useful in each field like science, healthcare and education sector. Internet provides the various features such as security, flexibility, QoS, and provides tools for network monitoring, management etc (Osuo-Genseleke & Kabari, 2018; Jayanthi & Rabara, 2010). Internet provides various kinds of the protocols which define the architecture of internet. The various

internet protocols like IPv4 and IPv6 are developed. It varies as per network bits and range. IPv4 provides the range of 2^{32} bits and IPv6 has 2^{128} bits. The wireless sensors network (WSN) smart sensing devices to do the dynamic functions and maintain security (Neves & Rodrigues, 2010; InformationQ, 2016). In this paper, we point out the features in earlier internet generations and discuss about types of the internet, generations of networks, wireless network features and various other attributes involved after the development of new networks generations. It has to design for fulfill the needs of business, organizations, and government.

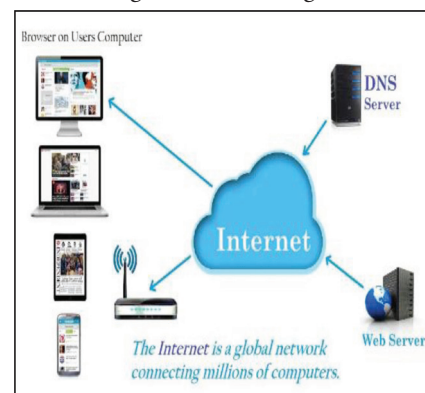


Figure 1: Internet connecting with different devices (InformationQ, 2016).

2. Evaluations of Internet Generations

The internet has various types of generations. The generation is internet 1.0, internet 2.0, and internet 3.0, internet 4.0 which is named as web 1.0, web 2.0 and web 3.0, web 4.0. The latest generation internet based on web 3.0 and 4.0.

Internet is almost 50+ years old. The first RFC is dated on April 1969 used by internet engineering task force. The two main generations of internet is used in last 20 years. During the first two decades, the most research projects are handled through internet (InformationQ, 2016). Networking is also used many technologies like: IBM, SNA, OSI, Digital DECnet, Appletalk, GENI. This generation is available till 1989 which is known as internet 1.0 or research internet (Paul, Pan & Jain, 2011).

After this a new generation developed that is known as internet 2.0 or commercial internet (Cedeño, Papinniemi, Hannola & Donoghue, 2018). In the beginning of 1989 internet entered into new phase and which is based on RFC and used for security purpose. The scalability issues are also resolved in this internet. Protocols like border gateway

protocol (BGP), Internet protocols and Open shortest path first (OSPF) was developed during this generation (Zinn, 2011).

After this new phase known as internet 3.0 or Next Generation Internet were formed. In next generation it has become an important part in our lives, our business, and our defense etc. Many new features are used in networking (Jain, 2006).

With the passage of the time the new generation is generated. Every new generation comes with some new tools and technologies and includes the features of previous generation also. On the basis on processing mode, language, technology used and architecture of the system the internet is divided into following generations:

- First Generation Internet
- Second Generation Internet
- Third Generation Internet
- Fourth Generation Internet
- Fifth Generation Internet

Table 1: Classification of internet generations (Obinna & Kabari, 2018).

Generations	Timeline	Processing mode	Language used	Technology used	System Architecture
1.0	1965	Time sharing and time slicing	Basic interpreter	Intergalactic network and the ARPANET	Large Number of users
2.0	1970	real-time processing mode(short time)	Programming in C	IPv6, multicasting, and Quality of Service (QoS)	RIA, WOA and social web
3.0	1995	OLTP	JAVA and XML	4G-LTE, 3G, Wifi and Fiber Optics	Service Oriented Architecture (SOA).
4.0	2010	real-time processing mode and the OLTP	JAVA and XML	WiMax and 5G	machine learning, internet of things;
5.0	2020	Macro Cells will use MIMO (multiple input, multiple output)	Prolog	IOT, Cloud Computing	Radio Access Technology (RAT) in the mobile terminal.

3. Features of Generation Internet

- **Security:** While using internet the maintaining security is the major issue. The Next Generation Internet provides the feature of authentication to source, destination and intermediate user. Privacy of place, confidentiality of data and integrity of data are also held in Next Generation Internet (Chauhan & Sharma, 2014). In Next Generation Internet the IPv4 is replaced by IPv6 and IPv6 is more secure (Dutton & Blank, 2014).
- **Quality of Services:** Quality of service (QoS) is a very important features used in Next Generation Internet. The Quality of service is usually checking the overall

performance of computer network. Quality of service a very important concept it means to transfer the data without traffic. The Quality of the service is technique to manage network resources (Lydia, Shankar, Ilayaraja & Kumar, 2018; Dutton & Blank, 2014).

- **Person-to-Person Communication:** The person-to-person communication is a very important feature in Next Generation internet it means each person can communicate with each other means direct connection exits from source to destination. Each and every machine provides a IP address, by which they can directly communicate with each other (Dutton & Blank, 2014; Panwar, Sharma & Singh, 2016).

- **Performance:** As per the demand of the internet the number of services is increased and the resultant ratio of external traffic to internet traffic is also increased. The cause of this speed and performance of an internet is degrades. This problem can overcome in the Next Generation Internet. There has no any effect on performance of the internet (Joiner et al., 2013; Agiwal, Roy & Saxena, 2016).
- **Faster Access to Information:** The speed of data transfer rate of Next Generation Internet is high as compared to other generation. Mainly they use IPv6 they use 128 bit length. They use very high rate of the data. The search engine of the internet is high as compared to other network (Cedeño, Papinniemi, Hannola & Donoghue, 2018).
- **Wireless Connection:** using the wireless communication like mobile phone etc. internet users can used by hand. But before there is a problem of bandwidth. In Next Generation Internet they give a bandwidth as the requirements of user (Ajibo et al., 2018).
- **Real Time Services:** The Next Generation Internet provides real-time services. Many emergency and protecting services provided or run on the internet. The Next Generation Internet can use this by using shared internet (Eze, Sadiku & Musa, 2018).
- **Data Transfer Rate:** The data transfer rate of Next Generation Internet is very high. The transfer rate is more than 30 Mbps which gives a transfer rate is more than 30mb/sec on internet (Lai, Wang, Xie & Cheng, 2019).
- **Flexibility:** The new generation of internet use IPv6 protocols. It means internet protocols version six that provides the address space of 128 bits or that about address is equal to: 340,282,366,920,938,463,374. IPv6 provides flexibility to expand networking size.

3. Literature Review

Keswani et al. (2020) this paper focus on the security features based on wireless network system. In this paper the author emphasis on the security features and provides encryption mechanism also and brief about the network protocols such as IPv4 and IPv6. Bonnaud (2020) this paper discuss about the microelectronics technology used in Next Generation Internet. In this paper the sensors are connected with help of IoT devices this paper show the working of French microelectronics device and discuss the various applications areas. In future they will try to make new microelectronic device. Niraja et al. (2020, January) this research paper discuss about the Next Generation Internet used to measure the radio frequency identification and also brief about the

security issues in IoT and maintain the security and privacy of our digital data. Tian at al. (2001) this paper is based on Next Generation Internet protocol. The test tools were conducted to check the status of the network configuration and also test the ICMPV6 and general specific protocol. The implementation of IPv6 done through Linux and report was formed. It also provides the transition methods to convert IPv4 into IPv6 network protocols. Osuo et al. (2018) provides us the various features of internet. The authors also focus the security related issues and try to resolve it. He gives the ideas about why IPv6 has more advance features than IPv4.

Jayanthi et al. (2010) this paper do their working on IPv6 and compare protocols of IPv4 and IPv6. This paper discusses the features and advantages of IPv4. Header format of IPv4 and IPv6 architectures are also brief in this research article. This paper also emphasis on the limitation of IPv4 and how it overcomes by IPv6. Jain et al. (2006, October) this paper is based on internet generation 3.0 which are named as GENI. The architecture of 3.0 is discussed in this paper. The top ten features of Next Generation Internet architecture are also briefing in this research article. In this paper the problems of internet generation 2.0 is fixed and try to resolve with the help of 3.0 architecture and perform working on wireless networking, optical and distributing sub system. Obinna et al. (2018) is used to study about the generations of internet and compare the internet features in past, presently and discuss future scope. Rupprecht et al. (2018) this paper focus on the security related issues based on last three generations and discuss about the method in 5G to support the security of wireless devices. The authors also explain the architecture of generic mobile network. The author also explains all types of the mobile attacks and provides the method to prevent our mobile from various attacks. William H. Dutton et al. (2014) this paper is mainly focus on the increase the users demand of internet as per the passage of time and discuss the experimental study which shows the reason of development of Next Generation Internet. The researcher also compare the other information media, information seeking and by location used by users in generation first and latest one with the help of graphical representation. In discuss the future scope of Next Generation Internet. Panwar et al. (2016) this paper is based on the 5G next generations mobile communication devices. In this paper the author focus on three fundamental features like low latency power, world wide connectivity and high data transfer rate. In paper also discuss the limitations of previous generation and expected to fulfill that requirements in Next Generation Internet. Sánchez et al. (2013) this paper discuss about the new generation internet protocol based on the multimedia service (IPMS) and pay attention on voice message communication and also discuss the various telecommunication services.

Agiwal et al. (2016) this survey paper focus on the 5-generation wireless network protocols and also discuss the features like Quality of service (QoS) as compared to the 4G and previous generations of internet services. Issues and challenges of previous generations are also brief in this paper. All the physical layer technologies are discussed. Hawilo et al. (2014) This paper focus on the challenges and implementation using next generation mobile internet and implement the working of mobile data. The author also performs their working based on Network Functional Visualization (NFV). Ajibo et al. (2018) this paper focus on the wireless network integrate with the broadband device with the using of new generation network device. This paper performs their working on LTE Network as a backbone device and performs the working of system as broadband device. As a result LTE provides the efficient and reliable network to all broadband devices. Eze et al. (2018) is mainly working on 5G wireless mobile network and also discuss the evaluation of various generations of internet. The various application areas are also discussed from generation first to fourth. The fifth generation technique is under development stage and performs the great revolution in the area of mobile marketing. Anbar et al. (2018) in this research paper various machine learning techniques are used to detect and control the routing flood with the help of Next Generation Internet protocol (IPV6). IPV4 is replaced by IPV6. Carisimo et al. (2019) In this paper the researcher compare the IPV4 and IPV6 and

use the k-core decomposition graph theory to check and increase the end user. Authors pay more focus on evaluation the geographical region of IPV4 core.

Zhani et al. (2020) this paper discuss about the internet architecture using the Next Generation Internet and discuss the layers of OSI model and discuss the limitation of internet like compatibility issue and emphasis on the network services provided by internet. Arshad et al. (2019) is review on the cellular technology change according to the various generations and discuss about the features like QoS, online gaming etc and compare the various generations based on frequency, bandwidth and performance. Reddy et al. (2019) discuss the generations of various network devices such as wireless network. This paper also discusses the basic architecture of 5G and 4G and discusses the implementation threat of 5G technology. Kumar et al. (2020) this paper discuss about the 5G wireless network security and discuss about the various internet generations and how the generations change as per the customers demand and new features are developed as the passage of the time. The author discuss about the feature of 5G network and develop new technology like Artificial intelligent (AI) and Internet of things (IOT) but this technology is under development. Pico-Valencia et al. (2020) this paper emphasis on the various paradigms and services provided by IoT device like IoT and discuss that how IoT is used in Next generation. In this paper agent based object for the next generation IoT device.

Table 2: Summary of Internet Generations.

Year Of Publications	Generation	Technology	Advantages	Issues
2010(Jayanthi & Rabara, 2010)	3G	IPV4,IPV6,WSN Protocols	With the help of IP Dynamic routing protocol can generated.	Security is the main issue in the internet.
2010(Neves & Rodrigues, 2010)	1G,2G	Web 2.0 technology	Compare the generation first and second and based on new functionality the amount of users are increased.	Web 2.0 is less significant. So new technology can developed.
2011(Paul, Pan & Jain, 2011)	4G	TCP/IP, internet 2.0	The new internet architecture is developed and works on the various projects.	Change the routing architecture.
2012(Zinn, 2011)	4G	SIP,IP-IMS	The new generation internet provides multimedia service and adopts IMS technology.	New multimedia can generate.
2013(Joiner et al., 2013)	3G	IPV4,IPV6	This paper is basically comparing the number of users using internet of generation first and new one.	New features like speed, data rate, and multiple devices can connect at same time.
2013(Sánchez-Esguevillas, 2013)	1G,2G	Web 2.0 technology	Compare the generation first and second and based on new functionality the amount of users are increased.	Web 2.0 is less significant. So new technology can developed.

2014(Dutton & Blank, 2014)	4G	IPv6	In this paper IPv4 and IPv6 are compared and confirm the IPv6 gives best result and improve quality and efficiency of system.	Security and scalability is the biggest issue.
2016(Panwar, Sharma & Singh, 2016)	5G wireless network	IPv6, Multiplexing scheme,	With the help of 5G wireless network data transfer rate, connectivity, QoS and security increases	Energy consumption is more. More new features can generated with 5G wireless network.
2017(Salih, Ma & Peytchev, 2017)	5G	IPv6,SVM	Feature selection method is used to predict model and to detect the flooding attack.	The accuracy and efficiency of model can improve.
2018(Ajibo, 2018)	5G	header format	More flexible and new address coding is proposed.	Maintain security is difficult task.
2019 (Reddy, 2019)	Evaluation of 5G	Voice Over IP (VOIP), IPv6	The simultaneous wireless devices can connect and support all e-commerce transactions.	Should more intelligent technology can developed that can connect entire world without limit.
2020 (Kumar & Bansal, 2020)	5G	CDMS/ BDMA	Advance technologies and multi meter wireless that provides the greatest speed	Yet not implemented
2020(Pico-Valencia, Holgado-Terriza, & Quiñónez-Ku, 2020)	IOT	IOT Paradigms, IPv6	IOT and various agent technologies are integrated with each other to form new intelligent system.	More user friendly environment can created.

Finding and Conclusion

There is a huge transformation of internet after development of new generations. The static data transformation is now converted into dynamic transformation. The processing mode, system architecture, technology and language used in internet generation web 1.0, 2.0, 3.0, 4.0 and 5.0. The IPv4 is replaced by IPv6 that provides more security, improve quality of service (QoS), Performance, congestion control and so on. The critical issue is the range and number of users in IPv4 is limited. The address space of IPv6 is increased i.e. 2^{128} bits. Many new technologies such as wireless sensor network, IOT, Cyber Security, Cloud Computing are also developed that directly depends upon internet. It also provides the highly intelligent features. Even new internet protocols are also in the progress that would have more advance features and technologies.

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