Next Generation of Internet - Current Status and Plans

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ABSTRACT
The Internet is crucial to modern media, but it is also a dynamic technology that is continually developing as people embrace and reject new features, devices, and apps and utilize them in unexpected ways. Governments, scientists, and institu-tions are seeking new methods to deliver information swiftly and powerfully as the Internet gets larger and more congested. Since its start in the early 1980s, the Internet has evolved into a massive network. Today's Internet has three fundamental limitations: speed, address, and security. This conversation on the assignment report sheds light on the advent of new patterns of Internet access in everyday life and work via several devices, some of which are portable. Those that implement this new attitude are referred to as 'next-generation users.Internet2 and Next Generation Internet (NGI) play critical roles in today's world for quick and reliable communication. Both new Internets aspire to create new, quicker technologies to boost research and communication, and it is predicted that both efforts will eventually improve the present commercial Internet. In contrast, first-generation Internet users remain reliant on one or more personal computers in the home or business to access the Internet. The research demonstrates how this developing pattern of access is transforming Internet use and effect, such as by facilitating the creation of user- generated content. The present Internet Protocol version 4 (IPv4) cannot supply a sufficient number of unique IP addresses for all Internet- connected components. The report demonstrates how next -generation access is socially dispersed, resulting in a new digital gap perpetuating social inequalities

Keywords
Internet, multimedia, Voice, Internet Protocol, VoIP, Web Technologies, embedded

1. INTRODUCTION
The Internet as we know it today was not built to handle millions of users, severe congestion, multimedia, or real-time interaction.

Today's Internet does not provide:

dependable end-to-end performance, stimulate collaboration on new capabilities, allow testing of new technologies, or assist the development of breakthrough apps. Nonetheless, only the Internet can handle tremendous development and permit convergence of information work, mass media, and human cooperation [1]. For starters, the Internet will supplant the telephone network. Telephone traffic grows at a rate of less than 10% each year, but Internet traffic doubles every four months. If Internet traffic has not yet surpassed telephone by the end of the millennium, it will do so shortly. Following that, Voice over Internet Protocol (VoIP) will be a minor sidelight of the Internet. Television comes after the phone. Internet protocols and bandwidth will need to be upgraded before a television can be transmitted effectively, but it will ultimately migrate to the Internet.The Internet can make television interactive by providing a million channels. The author does not imply converting your TV into a PC display, nor does he suggest bringing the Internet through television networks (CTMs). He implies transmitting television over the Internet in packets utilizing Internet packets: VoIP. Then comes Internet telepresence. There will be significant communication substitutes for travel. Less commuting. Less time-consuming business trip to push the flesh. We'll wire up our houses and remain there.

Web 1.0, marking the birth of the Internet, appeared in the 1990s. This was made up of static, read-only web pages built solely by a few developers. Initially, it was one of the biggest achievements the world had ever seen since anybody could access published material. However, visitors could only read and browse these web pages and could not interact with them. Web 2.0 emerged in the 2000s. Its initial incarnation comprised a single stream of information from the online publisher to the user, but its more sophisticated version allowed for much more interaction and engagement. Users, for example, might create their own accounts in order to have distinct identities inside the network. Furthermore, Web 2.0 spawned the emergence of social networking sites such as Facebook, Twitter, and YouTube. During this period, the development of web technologies such as JavaScript, HTML5 (HyperText Markup Language 5), and CSS3 (Cascading Style Sheets 3) was critical in the creation of these dynamic web platforms. Web 3.0. This is a decentralized web that symbolizes the most recent generation of internet apps and services supported by distributed accounting technology, the most common of which is Blockchain.A network is a system made up of devices that allow information to be sent between locations or nodes

The analog telecommunication network emerged in the 1880s and was used globally for analog voice transmission until the early 1960s. For the previous few decades, digital communication technology has largely replaced earlier analog technologies. Digital personal computers were available on the market in the 1980s, and with lower prices, widespread usage of digital computers followed in the years that followed.The Internet was initially used for remote terminal login, before moving on to file transmission, e-mail, and newsgroups. We finally obtained Web publishing a long time later. There is now Web commerce. What comes next?

Internet2 is supported by high-tech corporations and col-leges, whereas Next Generation Internet is a US government effort. Both new Internets aspire to develop new, quicker technologies to improve research and communication. [2] As the Internet becomes larger and more congested, the govern-ment, scientists, and institutions have launched two projects: Internet2 and the Next Generation Internet (NGI). Both new Internets aspire to create new, quicker technologies to boost research and communication, and both efforts are intended to improve the present commercial Internet eventually. The Internet of the future will service billions of people and devices, enabling the convergence of today's applications with multimedia (telephony, video-conferencing, HDTV), linking personal computers, servers, and embedded computers, and enabling hitherto unexpected applications and difficulties. [3]

2. GROWTH OF NEXT-GENERATION USERS

Along with trends in mobile phone use and the spread of equipment such as tablets, we witnessed two substantial and connected developments in our survey results in 2011. First, there has been a steady growth in the share of users who utilize portable devices to access the Internet, such as a smartphone. This was a minor fraction in 2003. At the time, 85% of British citizens had a mobile phone, but just 11% of mobile phone users indicated they used it to access email or the Internet. By 2009, 97% of British adults possessed a mobile phone, and the proportion of users accessing email or the Internet via their phone had quadrupled to 24%—though this is still a small percentage of users. This climbed to nearly half (49%) of all users in 2011. By 2011, the mobile phone has become one of a handful of portable Internet access devices both inside and outside the home. Most commentators have classified these developments as distinct trends. There are academics who solely study mobile communication, while others study tablets or smart phone use. [5] These two tendencies, however, are not just connected but also synergistic. Those who possess numerous devices are also more likely to use the Internet when traveling and from different locations. Internet users frequently utilize several devices to access the Internet, such as various PCs, readers, tablets, and laptop computers, in addition to mobile phones. Only 19% of people have a PDA in 2009. (Personal Digital Assistant). Since then, the development of readers and tablets has exploded, as seen by Apple's successful launch of the iPad. The concept of a PDA has become obsolete. In 2011, over one-third of Internet users owned a reader or a tablet, with 6% owning both 59% had an Internet connection through one or more of these various devices other than the family computer [6].since the Oxford Internet Institute's (OII) initial assessment of Internet use in 2003, and in accordance with most other developed countries, access has been based predominantly on the use of a personal computer in one's home, linked to the Internet through a modem or broadband connection. For many, this was supplemented by comparable access at work or school. Since 2003, the biggest shift in access has been the transition from narrowband dial-up to broadband always-on Internet connections. By 2009, virtually all Internet users had a broadband connection, which increas-ingly included wireless connections within the home, such as via a WiFi router. According to this criteria, over one-third of Britons and 44.4% of Internet users in the UK were Next Generation Users in 2011. Despite several government and corporate programs to get people online, digital disparities in Internet access persist. The modest development in the number of British individuals having Internet connection contrasts

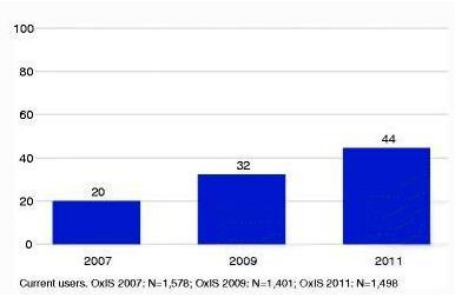

Fig. 1. Percentage of next-generation internet users

sharply with the fast rise of Next Generation Users. By 2011, they had climbed from 13% to 32% of the British population. First-generation users have fallen from 54% to 40% of the British population. Clearly, the marketing of new technological gadgets, such as tablet, has transformed the way households access the Internet. It's difficult to dismiss this as a result of new product and service offers rather than a process of domestication. Next-generation users are not merely teens;

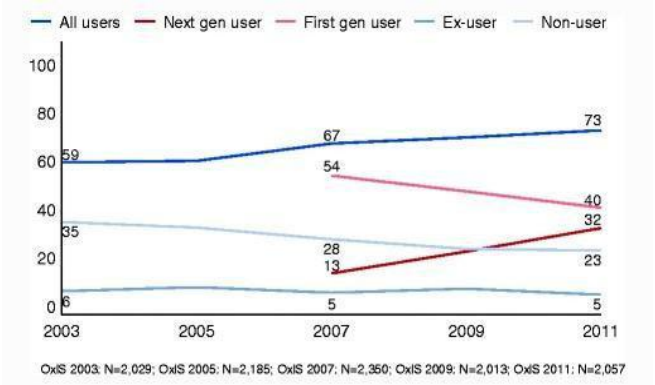

Fig. 2. Next generation internet users in context

they have arisen across all age groups as a result of long-term changes in usage habits. They did not arise overnight: with the advantage of hindsight, we can observe that the proportion of next-generation Internet users increased from 20% in 2007 to 32% in 2009, to 44% in 2011. (Fig. 1). Figure 2 represents the increase of Next Generation Users in relation to overall Internet use. British Internet use increased from a little under 60% in 2003 to 73% in 2011, leaving over a quarter of the British population without Internet access. The proportion of persons who have never used the Internet (non-users) has been steadily declining, while the proportion of those who have used the Internet but no longer do so has been relatively stable.

3. THE ANALYSIS OF THE DEMANDS OF NEXT-GENERATIONINTERNET

The networking research community has been engaged in an ongoing discourse about how to move the Internet ahead for some years, and there are currently two distinct methodologies that have been acknowledged for Internet research. The first strategy is centered on exploiting the current Internet infras-tructure to overcome key technological difficulties, which is referred to as'evolutionary' research. Evolutionary research seeks to address basic Internet problems without disrupting current architecture while adhering to restrictions such as par-tial deployment, backward compatibility, and implementation practicality. The Internet Engineering Task Force's (IETF) IPv6 is a good example of an evolutionary method. The second method, known as the "blank slate," is creating an altogether new Internet infrastructure.On October 10, 1996, US President Bill Clinton declared his support for the Next Generation Internet (NGI) plan, which is built on robust research and development initiatives across government agencies.

It is widely acknowledged that encouraging the use of simple and practical technologies such as layered and dis-tributed architecture, connectionless packet switching, and scalable routing has been the foundation of the Internet's fast development and spread over the last several decades. Long-term, large-scale experiments have gradually yielded such technology. The Internet architecture has been shown to be multidimensionally scalable in practice. As a result, we consider Transmission Control Protocol/Internet Protocol (TCP/IP) to be the Internet's DNA. We should retain and advance the technological essence of the present Internet architecture to the maximum degree feasible. This preservation should allow for future growth, progress, and innovation. To preserve its major position in future-generation Internet research, architecture must be studied as the cornerstone of next-generation Internet fundamental research.

The IPv6 protocol and related technologies should be regarded as critical components in the transition to the next generation Internet. According to our findings, the future generation Internet should address the key technical issues of its predecessor, the current Internet, in the areas of scalability, high performance, real-time, mobility, security, manageability, and economics. The next generation of the Internet is focused on goals:

- The potential of the future generation Internet to overcome the existing Internet's illogical economic model, in which network operators invest extensively in the creation of networks at a loss, is referred to as economy (while network information content providers offer network-based services at a high profit).
- The ability of the next-generation Internet to provide fine-grained network management features and mechanisms, hence providing users with dependable and complete network administration capabilities.
- The capacity of the next generation Internet to leverage sophisticated wireless mobile communication technology to create an 'anywhere, anytime mobile Internet and genuinely become a tool for people's work, living and learning is referred to as mobility.
- The capacity of the next-generation Internet to change the existing 'best effort' quality-of-service approach into a more controlled and dependable quality of service is referred to as real- time. Next-generation Internet applica-tions such as multicasting, large-scale video, and real-time interactivity can be handled by this new, more dependable service.

High performance refers to the ability of the future-generation Internet to deliver faster transmission speeds; specifically, end-to-end transmission speeds should approach 10 or 100 Mbpsin order to enable next-generation Internet applications. The capacity of the future generation of Internet to develop a complete security system is referred to as security. This system will be built on basic sharing features as well as the provision of authentication and tracing capabilities, resulting in a more secure and trustworthy network service.

A. Next generation Internet architecture

the next-generation Internet's multidimensional scalability by presenting a multidimensional scalable next -generation Internet architecture (shown in figure 3) and detailing its five main aspects.

- IPv6 is the network layer protocol standard for the future generation Internet. It contributes to the future generation Internet's specified scale scalability and security scalability.
- Authentic IPv6 addressing: many of the present Internet's security issues stem from non-authentication of source addresses. The use of legitimate IPv6 addressing in the future generation Internet will aid in achieving the needed security and service scalability [7].
- Scalable processing capacity of network nodes: As user demands expand, the main exchange node of the future generation Internet should have scalable processing capacity. This will aid in achieving the necessary performance scalability and scale scalability [8].
- Connectionless quality-of-service control: The Internet's capacity for quality-of-service control is a current research area. One of the aims of next-generation Internet research is to achieve quality-of-service control based on hop-by-hop and connectionless routing, which is seen to have the potential to increase performance scalability and service scalability [9]
- Network transition strategy from IPv4 to IPv6: the next generation Internet should collaborate with the present Internet to deliver services to consumers. However, present transition solutions are only appropriate for a small-scale IPv6 network. More research is needed to investigate the techniques for transitioning from IPv4 to a next-generation network using IPv6 as its primary protocol. This will aid in achieving the needed function and service scalability [10].

B. GOALS OF NGI

The "Next Generation Internet" is divided into three parts: applications, services, and infrastructure. The NGI initiative's three aims are:

- Goal 1: Experimentation for Advanced Network Technologies

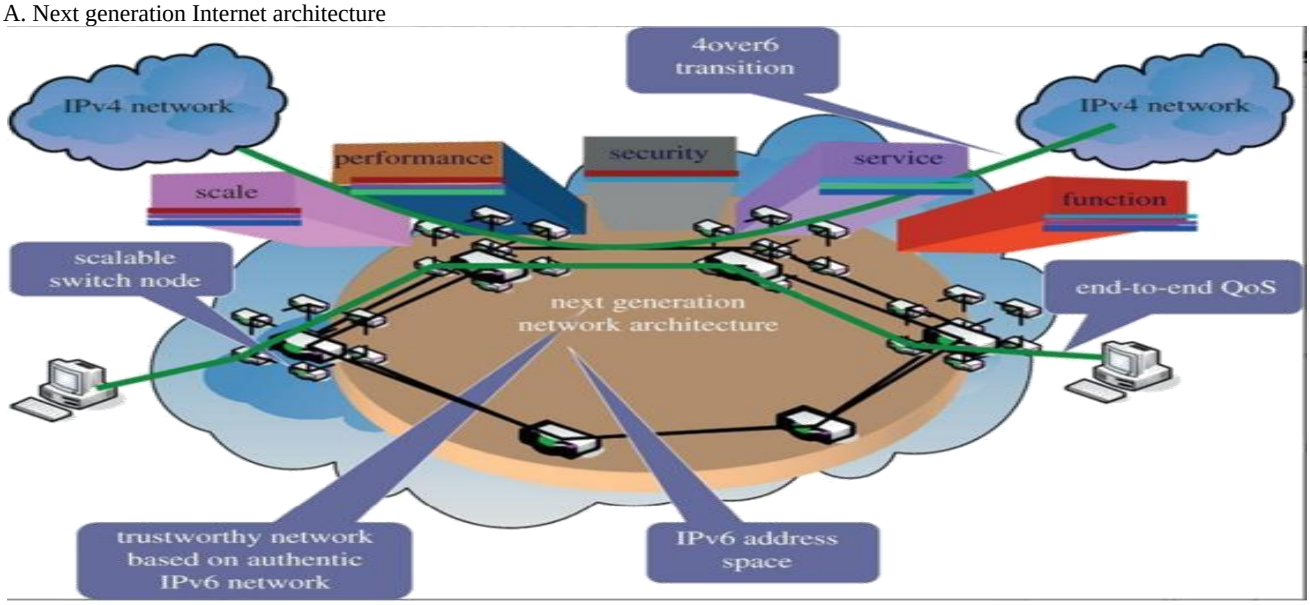

Fig. 3. Multi-dimensional scalable next-generation Internet architecture. QoS, quality of service

- Goal 2: Next-Generation Network Fabric.
- Goal 3: Groundbreaking Applications

4. INTERNET2

Internet2 is a non-profit computer networking consortium led by members of the research and education communities, industry, and government in the United States. The Internet2 consortium's administrative headquarters are in Ann Arbor, Michigan, with offices in Washington, D.C. and Emeryville, California. As of November 2013, Internet2 has approximately 500 members, including 251 institutions of higher education, 9 partnerships and 76 organizations from business, over 100 re-search and education networks or connector organizations, and 67 affiliate members. In 2007, Internet2 launched its newest dynamic circuit network, the Internet2 DCN, an innovative technology that enables user-based data circuit allocation across the fiber-optic network. Through its regional network and connector members, the Internet2 Network connects over 60,000 educational, research, government, and "community anchor" institutions in the United States, ranging from primary and secondary schools to community colleges and universities, public libraries and museums, and health care organizations. The following are some of the advantages of using Internet2 today:

- Capability to transport vast volumes of research data in realistic and predictable time frames.
- Remote scientific instruments can be controlled in real time.
- Remote computer clusters are operated as a grid, making them seem to users as a single unit.
- Collaboration in the development of music, dance, or other forms of performance art.
- Access to high-quality interactive video tools, as well as the opportunity to connect with others in real-time through video.
- Distributed file storage that is shared.
- High-performance computing systems are available.
- Data mining skills are required.
- Access to digital library materials such as high-resolution images, music, and video.
- Opportunities for collaboration with researchers, aca-demics, staff, and students at other member institutions who use Interent2.

Internet2 provides a network that meets the bandwidth-intensive needs of the US research and education sector. The network is a hybrid optical and packet network that is dynamic, resilient, and cost- effective. It provides a 100 Gbit/s network backbone to more than 210 educational institutions in the United States, as well as 70 enterprises and 45 non-profit and government organizations.

The Internet2 consortium's goals are as follows:

- Creating and sustaining a cutting-edge network.
- Using new-generation applications to fully use the poten-tial of broadband connections.
- Transferring innovative network services and applications to all levels of school, and eventually to the larger Internet community.

The network is used for a variety of purposes, including collaborative applications, distributed research trials, grid-based data processing, and social networking. Some of these applications, such as IPv6, an open-source middleware for secure network access, Layer 2 VPNs, and dynamic circuit networks, are in various stages of commercialization. These technologies, as well as their organizational counterparts, were developed to provide a quicker alternative to the Internet.

The Abilene network has enabled several sectors to stimulate innovation, research, and growth in ways that were not before feasible. Users of low- quality libraries may now obtain not just text but also sound recordings, animations, films, and other previously inaccessible items. Another use that is now available to Internet2 members is robust video conferencing. During surgery, neurosurgeons may now video chat with other specialists in the field in high definition with no apparent time lag.

The fourth phase of the Internet2 Network is now in place and will deliver an unparalleled 8.8 Terabits of bandwidth, ex-tending into underdeveloped parts of the country. Built with a federal stimulus grant from the National Telecommunications and Information Administration's Broadband Technology Op-portunities Program (BTOP), the infrastructure uses standards-based technologies and protocols, and will support the same wide range of IP and optical services available today—from cutting-edge IPv4, IPv6, and multicasting to static and dy-namic point-to-point circuits—and is already stimulating a new generation of innovative capabilities.

Fig. 4. Internet2 Network Infrastructure Topology.

Internet2 Advanced Layer 2 Service enables members to build Layer 2 circuits between endpoints on the Internet2 Net-work and beyond, providing users with cost-effective, highly reliable solutions—whether it's the "big data" needs of global science researchers, or the ability for innovators to program the network itself using software-defined networking (SDN) technologies like Open Flow. All of this dependability and flexibility are now available in a single innovation platform.

5. CONCLUSION

Internet2 is a national and worldwide network of inter-connected high-performance networks that allow members to engage and build network applications in ways that the commodity Internet does not allow. Internet2 increases net-working capabilities for the research and education communi-ties by connecting hundreds of member research universities, linked organizations, and business partners.NGI's primary deliverables were the design and implementation of network communication architecture that improved data access, human communication, and productivity while also attaining much higher Internet bandwidth speeds. The next generation of the Internet will connect places at 100 times the speed of the existing connection. Such a strong connection allows for the use of existing methods and approaches to some extent.

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