INTERNET2 : AN INTRODUCTION

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ABSTRACT

Internet2 was founded by the research and education community to serve its advanced networking needs and meet its bandwidth-intensive requirements. It is an alternative offering and the academic world's response to the deficiencies (such as congestion and reliability, limited IP addresses) of the original Internet. However, the term Internet2 is still obscure to many. This paper provides a brief introductiob on Internet2.

Key words: Internet2, Internet1, *networking. bandwidth.*

1. INTRODUCTION

The current, original Internet (now referred to as Internet1) was not designed to handle applications such as online education, e-commerce, and interactive multimedia. Internet transmissions are often unreliable. Congestion results in packet loss. Internet cannot prioritize traffic since all packets receive the same priority. It has limited IP addresses. The rapid growth of Internet usage by individuals and corporations has made it difficult to use the network for research. These deficiencies have frustrated millions of users. As a result, Internet2 was created in 1996.

 The objective of Internet2 is to establish a next-generation Internet which will enable scholars to collaborate with colleagues around the globe. The goals of Internet2 are to create a leading-edge network capability, enable revolutionary Internet applications, and ensure the rapid transfer of new network services [1]. Internet2 is meant to address the shortcomings of Internet1. Applications such videoconferencing, uncompressed HDTV, gigabit data set sharing, weather forecasting, satellite

imaging, telemedicine, and remote vision require high bandwidth and real time response. Internet2 came as a result of engineers having difficulty moving or storing huge amounts of data.

The idea of Internet2 was initiated in 1996 by 34 U.S. universities collaborating with government and industry to apply advanced networking tools to meet the emerging needs in higher education. A list of members as at January 1997 is provided in [2]. The members established a University Corporation for Advanced Internet Development (UCAID) (http://www.ucaid.edu). It is a non-for-profit computer networking consortium with headquarters in Ann Arbor, Michigan.

The government played a leading role in the development of Internet2. In April, 1998, the Vice-President Al Gore announced funding for Internet2. He promised that Internet2 would empower American industries and give us a higher quality of life [3]. Internet2 now has more than 300 members.

2. APPLICATIONS

Teams of academic researchers and industry experts will design network-aware applications. This will require a multidisciplinary effort. The Internet2 community applies network technologies for the future of the Internet. Internet2 based technologies enable new ways for connectivity and interface. These technologies include large-scale network performance measurement and management tools, secure identity and access management tools, and capabilities such as scheduling high-bandwidth, high-performance circuits [4]. Internet2 has been used to foster creativity, research, and development in a manner that was not possible before. It will define the future of education and make learning more accessible, interactive, and affordable.

Abilene is one of Internet2's backbone, using optical transport technology and high-performance routers. Fiber optics will be a major role in developing infrastructure for Internet2. It provides high bandwidth data highways for connecting regional and global communities. Interne2 consortium intends to upgrade Abilene high-speed network backbone and implement IPv6 (Internet Protocol version 6) while continuing to support IPv4. IPv6 opens the door for many application such as mobile devices, multicasting, and one-to-many communications.

Major beneficiaries of Internet2 will be research libraries, digital videoconferencing, multimedia presentation, medical imaging, massive electronic submission, distance education, and teleconsultaton. Scientific and medical applications can benefit from Internet where data can be transmitted in seconds versus hours. The benefits of Internet2 are endless and its future holds much promise [5].

2.1 INTERNET2 ISSUES

Several policy issues arise from Internet2 [6]. First, Internet2 as an organization is elitist. Participating members must be willing to pay about $500,000 for membership and about $110,000 to connect to Abilene network. It is needless to say that such resources are not available at every college or university. For this reason, the majority of colleges and universities are not included in these pioneering efforts.

Second, there is the problem of migrating developed applications to the current Internet. Internet2 has promised to ensure rapid transfer of new technologies and services to all sectors of society. To be successful, Internet2 technologies must migrate to commercial networks.

Third, there is pressure, risk, and expense involved in developing Internet2. With technologies changing at a rapid pace, no one knows which technologies will be appropriate five or ten years from now.

Fourth, Internet2 faces questions about its ability to provide something that is not available in Internet1. Some academics believe that if the network is there, applications will follow.

3. CONCLUSION

Internet2 is a testing-ground and networking environment for developing advanced Internet technologies such as telemedicine, digital libraries, and virtual laboratories. The technologies developed by Internet2 community advance research and accelerate discoveries across the globe. While Internet2 as an organization is elitist, its goals are worthy and achievable. Internet2 as a network will not solve all the problems of Internet1. Internet2 is still evolving. It has partners in Europe, Africa, Asia, and Middle East with the goal of connecting research communities around the globe. The next Internet2 Global Summit is in April 23-26, 2017. For more information on Internet2, see http://www. internet2.edu

REFERENCES

[1] R. V. Horn, "Technology - Internet2 and the K20 Initiative," *Phi Delta Kappan*, vol. 83, no. 6, February 2002, pp. 481, 482

[2] L. Saunders-McMaster, "Internet2: an overview of the next generation of the Internet," *Internet Librarian*, March 1997, pp. 57-59.

[3] A. Stone, "Internet2's breakthroughs for academic research," *IEEE Distributed Systems Online*, vol. 5, no.1, January 2004, pp. 1-5.

[4] "Internet2," Wikipedia encyclopedia, https://en.wikipedia.org/wiki/Internet2

[5] M. E. Chen, "The effects of an Internet2 implementation at the food and drug administration: a case study," *Doctoral Dissertation*, Capella University, 2010.

[6] R. E. Dugan and J. F. Trump, "Internet2: Separate and Unequal," *The Journal of Academic Librarianship*, vol. 25, no. 2, March 1999, pp. 127-131.

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