Towards an Evolutionary Next Generation Avian Carrier Internet Architecture

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Categories and Subject Descriptors

C.2.1. [**Computer Communications and Networks**]: Network Architecture and Design

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1   Introduction

In the last 10 years, there have been many design proposals for a next generation Internet architecture intended to improve the performance, security, and availability of today's Internet. While these proposals have mostly leveraged recent advances in network hardware and traffic trends, there has been a dearth of research looking at a new Internet architecture based on CPIP (Carrier Pigeon Internet Protocol)[2]. We believe it is important to fully explore the design space of architecture possibilities to better inform the community about what should go into a new architecture.

Avian-based protocols have until recently been considered flights of fancy. In this paper we discuss how to extend the principles of CPIP (Carrier Pigeon Internet Protocol) to handle a variety of modern applications. In particular, we show how our Avian Carrier Internet (ACI) architecture supports an evolutionary model that can adapt with the changing communication models of Internet traffic. We begin with a short review of CPIP and some basic additions to the protocol and "birdware" to modernize the technology for today's environment. Next, we explain ACI's methods of providing an evolutionary framework for future Internet applications. We then discuss the potential drawbacks of implementing such a scheme. Eventually, we close with a brief discussion of related work and potential avenues for further research in this area.

2   Birdware Modifications

After months of research, we discovered that the main problem with RFC1149 and RFC2549 [3] is the use of paper scrolls for data storage. Such a system does not take advantage of the improving capacity of flash drives. Our modification is to replace the paper scroll data storage technology with the latest in NAND flash technologies. Furthermore, in concert with the avian trend, we use duck tape instead of duct tape to secure the drive to the birdware's legs[1]. In order to support an end-to-end model of security, the data on the flash disk can be encrypted by one-time-pad technology. We use paper scroll data storage technology to store the one-time-pad on the other leg for nearly unbreakable security guarantees.

3   Evolutionary Model

Perhaps the most important contribution of this paper is the unintuitive melding of science and technology. We leverage off of recent Darwinian models of evolution, though we are open to other models of

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[1]If the birdware is of the duck species, we may be able to avoid such methods.

evolution should they be discovered. In our architecture, we use avian breeders to selectively choose for species traits that are conducive to the architecture. The end goal of avian breeders is to produce fast-flying, super-strong avian carriers. These traits are necessary to provide low-latency, high-bandwidth characteristics. The intelligence of the avian carriers must necessarily be sufficient to prevent forwarding loops from occurring in Super Wide Area Network (SWAN) environments.

As genetics research continues to flourish, we envision a transition to genetically-created species to provide a quicker turnaround time for avian carrier modifications. For example, we may use the hawk's quick diving speeds along with the pterodactyl's enormous size as one possible avian carrier species. We also envision the possibility of a hummingbird-cheetah species to support real-time applications such as Voice-over-Internet-Peregrine and pigeon-based CooTube video content delivery.

4   Issues of Packet Loss

ACI continues to push the 'best-effort' model of data delivery on the Internet as the original RFCs intended. As a result, packet loss is often inevitable. In particular, ACI is susceptible to normal types of packet loss expected with an avian-based datagram system, such as glass windows, sky-blue painted buildings, redneck hunters, and avian bird flu pandemics. We expect that with time, avian carriers can be scientifically engineered to be resistant to such sources of failure, although people seem to really like glass and we have no current solutions to this problem (perhaps human computation methods are necessary).

One open problem is that of Denial of Service attacks. Figure 1 shows an example scenario [1] that could result when an attacker tries to packet flood a destination comprised of children. One possible solution is to arm every human with a device capable of putting up a wall of fire, or what we term a 'firewall,' to defend against these attacks.

Figure 1: Potential Damage by DoS Attack in ACI

5   Future Work and Conclusion

While ACI provides an architecture for an evolutionary next-generation Internet architecture, its success depends on the ability of genetics research to combine hummingbirds with cheetahs. Given the slow process of legislation for avian stem-cell research, we believe there is merit in leveraging steroids to help provide incremental benefits to avian-carrier networks. Finally, we are looking at ways to improve latency with wormhole routing using our EBGW (Early Bird Gets the Wormhole) protocol.

Given our initial goal of exploring the design space of Internet architectures, we believe ACI stands out as a contrarian design that should improve networking research around the world. Our hope is that other Internet architecture proposals will continue to build off of our design for make benefit future generations.

References

[1] A. Hitchcock. The Birds, 1963.

[2] D. Waitzman. A Standard for the Transmission of IP Datagrams on Avian Carriers. RFC 1149 (Unrecommended Standard), April 1990.

[3] D. Waitzman. IP over Avian Carriers with Quality of Service. RFC 2549 (Unrecommended Standard), April 1999.