OpenHazuki: A Wireless Network

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Abstract

OpenHazuki is a planned future wireless network that would span the continental United States.

1 What?

OpenHazuki would be a wireless network implemented in fully commodity, shelf-bought, scrounged hardware. Ideally, it will use the 802.11 set of wireless transmission standards, and will result in wireless transit from the west coast to the east coast, entirely over the air with no ground connections.

2 Why?

OpenHazuki serves to prove a number of points in its implementation:

- Cross-country network rollouts can be significantly cheaper than current ones.

- Commodity hardware can create a decently performing network infrastructure.

- A completely wireless network infrastructure is entirely feasible.

Moreover, the functionality of OpenHazuki would enable it to provide potential competition for telecommunications providers and internet service providers, who are currently increasing fees and prices while their baseline costs decrease. It would also provide an experimentation network for various protocol rollouts and their effectivity over wireless (such as studying IPv6's header overhead or the routing efficiencies of OSPF and BGP).

OpenHazuki would also prove important in times of a network outage, such as a massive fiber cut that cripples the continental US. Wireless networks have no such problems, and connectivity losses due to operator error will be less common due to the unattended nature of the wireless nodes.

3   OpenHazuki?

OpenHazuki was derived from Hazuki, a character from the Japanese animation "Tsukuyomi Moon Phase ". As it stands, we are incurable Japanese animation addicts, and this is our little homage to the people who made such a good series.

4   Implementation?

The details of implementation are various, and may need to be ironed out as the project goes along. However, the loose network consists of many individual wireless nodes, which communicate with each other via wireless and forward packets through each other. It is a simplistic model of the modern-day Internet. Each node would consist of a computer running either FreeBSD or Linux, on commodity i386 or embedded hardware, with Atheros chipset wireless cards.

Routing would be achieved through the use of the BGP protcol, using private ASNs, to ensure that no route leakage occurs accidentally. The Zebra Routing Suite will be used, or its descendent, the Quagga Routing Suite, as functionality demands.

Moreover, in the initial stages, the network will also use a private address space to make addressing easier (probably 10.0.0.0/8), and later on, Open-Hazuki may file an experimental IPv6 and IPv4 address block request form to ARIN. Preferrably said address space will not interfere with any FreeNetworks or already existing municipal wireless networks, as defined and listed on http://freenetworks.org

The antennas that are to be attached to the Atheros cards will most likely be a parabolic dish type, something like a DirectTV or satellite dish. Most likely, they will plug in via a pigtail into the card itself, neccessitating the need for a small computer node that can be in the general vicinity of the dish.

In order to span the country in less than 64 hops (the IPv4 hop limit), the nodes would need to be spaced ideally between 100 and 200 miles apart from each other. The current record (as of this writing) for 802.11b unamplified wireless links is approximately 55 miles. We think we can do better, resulting in a node count of about 32 for a cross-country, non-redundant transit.

There may be some nodes that are placed in unsavory positions, such as in the middle of the Great Plains, without power. To enable these nodes to operate, a battery pack with a solar panel recharger may be needed if no alternative source of energy exists, short of a wind turbine.

5   Future?

The future of OpenHazuki is intended to become a backup network provider, perhaps supplementing the current Internet backbone in dire times. Eventually OpenHazuki should become public, with public ASNs and a public IPv4 and IPv6 address space. Alternatively, it could function as an internet service provider providing service to those who do not have any cable, telephone, or

other communications running to their households or business. An upgrade of OpenHazuki to 802.16 or HIPERMAN technologies may be warranted to deal with the additional load that said task puts on the network.