**AIRBONE INTERNET**

**by**

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# Abstract

*The Airborne Internet is envisioned to be a large scale multichip wireless mesh network of civil aviation aircraft connected via long range highly directional air‐to‐air radio links. We propose a novel geographic load share routing metric to mitigate congestion in this network, taking into account the underlying link scheduling constraints with directional antennas. When forwarding packets for a given destination, a node considers not one but a set of next hop candidates, and spreads traffic among them based on queue dynamics. Our simulations show that introducing this flexibility in the routing function can greatly increase a node’s ability to satisfy its bandwidth demands during link scheduling, yielding significant performance improvements in terms of network throughput and average packet delay. The ability to exploit this flexibility depends on the spatial reuse of the underlying network. For the simulated scenario, an increase in network throughput of 200% on average is shown, compared to a state‐of‐the‐art geographic routing algorithm.*

**INTRODUCTION**

Airborne Internet is a private, secure and reliable peer-to-peer aircraft communications network that uses the same technology as the commercial Internet. It is an implementation which connects aircraft to a ground-based Internet access node, including the information which is passed across this communication link. It provides airborne access to wealth of Internet information and resources. It is convenient and has several uses like flight planning, en route reservations, travel arrangements. It is useful in providing the information about weather, surrounding airspace environment and for aircraft-to-aircraft communications. The security applications include flight tracking/deviation monitoring, in-flight video monitoring, cockpit voice/video recording (Ramanathan, 2005).

This Airborne Internet (A.I.) is an approach to provide a general purpose, multi-application data channel to aviation. In doing so, A.I. has the potential to provide significant cost savings for aircraft operators as it allows the consolidation of many functions into a common data channel. A primary application for A.I. is to track aircraft for the air traffic control system. Many other applications can utilize the same A.I. data channel. The applications available are only limited by the bandwidth available. A.I. began as a supporting technology for NASA’s Small Aircraft Transportation System (SATS). But there is no reason that A.I. should be limited to SATS class aircraft. All of aviation, and even transportation, has the potential to benefit from A.I. The principle behind the A.I. is to establish a robust, reliable, and available digital data channel to aircraft (Nelson & Kleinrock, 2013).

**How does satellite Internet operate?**

How do you access the Internet other than dial-up if you live too far from a phone company office for DSL and there is no cable TV on your street? Satellite Internet access may be worth considering. It's ideal for **rural** Internet **users** who want broadband access. Satellite Internet does not use telephone lines or cable systems, but instead uses a satellite dish for **two-way** (upload and download) data communications. Upload speed is about **one-tenth** of the 500 kbps download speed. Cable and DSL have higher download speeds, but satellite systems are about 10 times faster than a normal modem (Kato, 2008).

Firms that offer or plan to offer two-way satellite Internet include Star Band, Pegasus Express, Telexes and Tachyon. Tachyon service is available today in the United States, Western Europe and Mexico. Pegasus Express is the two-way version of Direct PC. Two-way satellite Internet consists of:

1. Approximately a two-foot by three-foot dish
2. Two modems (uplink and downlink)
3. Coaxial cables between dish and modem

The key installation planning requirement is a clear view to the south, since the orbiting satellites are over the equator area. And, like satellite TV, trees and heavy rains can affect reception of the Internet signals.

# WORKING MECHANISM OF AIRBONE INTERNET

The word on just about every [Internet](http://computer.howstuffworks.com/category-internet.htm) user's lips these days is "broadband." We have so much more data to send and download today, including audio files, video files and photos, that it's clogging our wimpy modems. Many Internet users are switching to [cable modems](http://computer.howstuffworks.com/cable-modem.htm) and [digital subscriber lines](http://computer.howstuffworks.com/dsl.htm) (DSL’s) to increase their bandwidth. There's also a new type of service being developed that will take broadband into the air (Sakhaee & Jamalipour, 2006).

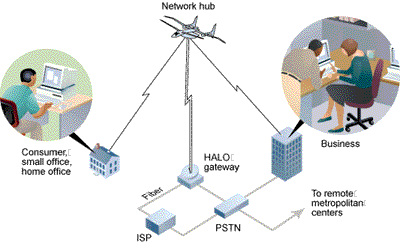


Figure 1: HALO Network (Sakhaee & Jamalipour, 2006).

At least three companies are planning to provide high-speed wireless Internet connection by placing aircraft in fixed patterns over hundreds of cities. [Angel Technologies](http://computer.howstuffworks.com/framed.htm?parent=airborne-internet.htm&url=http://www.broadband.com) is planning an airborne Internet network, called **High Altitude Long Operation** (HALO), which would use lightweight planes to circle overhead and provide data delivery faster than a [T1 line](http://computer.howstuffworks.com/question372.htm) for businesses. Consumers would get a connection comparable to DSL. Also, [Aero Vironment](http://computer.howstuffworks.com/framed.htm?parent=airborne-internet.htm&url=http://www.aerovironment.com/area-telecom/telecom.html) has teamed up with [NASA](http://computer.howstuffworks.com/framed.htm?parent=airborne-internet.htm&url=http://www.nasa.gov) on a solar-powered, unmanned plane that would work like the HALO network, and [Sky Station International](http://computer.howstuffworks.com/framed.htm?parent=airborne-internet.htm&url=http://www.skystation.com/) is planning a similar venture using blimps instead of planes. Now we’ll look at the networks in development, the aircraft and how consumers may use this technology at their homes (Sakhaee & Jamalipour, 2006).

**The Net Takes Flight**

The computer most people use comes with a standard 56K modem, which means that in an ideal situation your computer would downstream at a rate of 56 kilobits per second. That speed is far too slow to handle the huge streaming-video and music files that more consumers are demanding today. That's where the need for bigger bandwidth Broadband comes in, allowing a greater amount of data to flow to and from your computer. Land-based lines are limited physically in how much data they can deliver because of the diameter of the cable or phone line. In an airborne Internet, there is no such physical limitation, enabling a broader capacity (Melodia & Akyildiz, 2005).

Several companies have already shown that satellite Internet access can work. The airborne Internet will function much like satellite-based Internet access, but without the time delay. Bandwidth of satellite and airborne Internet access are typically the same, but it will take less time for the airborne Internet to relay data because it is not as high up. Satellites orbit at several hundreds of miles above Earth. The airborne-Internet aircraft will circle overhead at an altitude of 52,000 to 69,000 feet (15,849 to 21,031 meters). At this altitude, the aircraft will be undisturbed by inclement weather and flying well above commercial air traffic (Shimamoto, 2005).

Networks using high-altitude aircraft will also have a cost advantage over satellites because the aircraft can be deployed easily -- they don't have to be launched into space. However, the airborne Internet will actually be used to compliment the satellite and ground-based networks, not replace them. These airborne networks will overcome the **last-mile** barriers facing conventional Internet access options. The "last mile" refers to the fact that access to high-speed cables still depends on physical proximity, and that for this reason, not everyone who wants access can have it. It would take a lot of time to provide universal access using cable or phone lines, just because of the time it takes to install the wires. An airborne network will immediately overcome the last mile as soon as the aircraft takes off. The airborne Internet won't be completely wireless. There will be ground-based components to any type of airborne Internet network. The consumers will have to install an antenna on their home or business in order to receive signals from the network hub overhead. The networks will also work with established Internet Service Providers (ISPs), who will provide their high-capacity terminals for use by the network. These ISPs have a fiber point of presence -- their fiber optics are already set up. What the airborne Internet will do is provide an infrastructure that can reach areas that don't have broadband cables and wires (Mauve & Hartenstein, 2010).

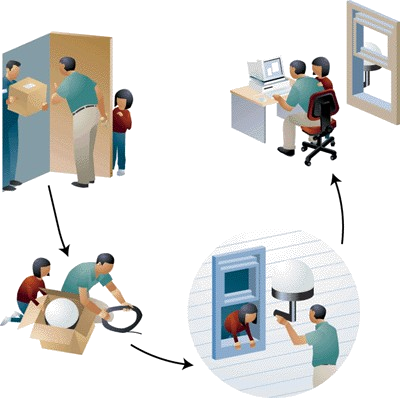


Figure 2: Airborne-Internet systems will require that an antenna be attached to the side of your house or work place (Mauve & Hartenstein, 2010).

**COMPARISON BETWEEN A.I & INTERNET**

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Internet** | **A I** |
| Distance of communication | Low | Very high |
| Line of sight obstruction | Not present | Present |
| Antenna weight | Can be high | Must be low |
| Bandwidth | Comparatively high | Broad |
| Delay | Not significant | Significant |

**FEATURES OF AIRBONE INTERNET**

The key features of the Airborne Internet Network are summarized below.

1. Seamless ubiquitous multimedia services.
2. Adaptation to end user environments.
3. Enhanced user connectivity globally.
4. Rapidly deployable to sites of opportunity.
5. Secure and reliable information transactions.
6. Bandwidth on demand provides efficient use of available spectrum.
7. It helps to avoid the connectivity down time of people in transit.
8. It helps to achieve a broader bandwidth.
9. It has the potential to provide cost savings for aircrafts operators.

**ADVANTAGES OF AIRBONE INTERNET**

According to McNary (2007) outlined the following advantages of airbone internet, the include the following:

1. The airborne Internet will function much like satellite-based Internet access, but without the time delay. Bandwidth of satellite and airborne Internet access are typically the same, but it will take less time for the airborne Internet to relay data because it is not as high up. Satellites orbit at several hundreds of miles above Earth. The airborne-Internet aircraft will circle overhead at an altitude of 52,000 to 69,000 feet (15,849 to 21,031 meters). At this altitude, the aircraft will be undisturbed by inclement weather and flying well above commercial air traffic.
2. Networks using high-altitude aircraft will also have a cost advantage over satellites because the aircraft can be deployed easily -- they don't have to be launched into space. However, the airborne Internet will actually be used to compliment the satellite and ground-based networks, not replace them.
3. These airborne networks will overcome the last-mile barriers facing conventional Internet access options. The "last mile" refers to the fact that access to high-speed cables still depends on physical proximity, and that for this reason, not everyone who wants access can have it. It would take a lot of time to provide universal access using cable or phone lines, just because of the time it takes to install the wires. An airborne network will immediately overcome the last mile as soon as the aircraft takes off.
4. The time people spend in transit could be turned into more productive time if network connectivity were available.
5. It would be a high-speed digital network. It has the potential to provide significant cost savings for aircrafts operators and the FAA, as it allows the consolidation of many functions into a common data channel.
6. Numerous applications can use the same data channel. Since the Aircraft are operated from regional airports, the equipment will be routinely maintained and calibrated. This also allows for equipment upgrades as technology advances yield lower cost and weight and provide increased performance.

**APPLICATIONS OF AIRBONE INTERNET**

Since the Airborne Internet provides broad band services, it increases the speed of downloading and uploading of data through it. A primary application for A.I. is to track aircraft for the air traffic control system. Aircraft pilots would let the traffic controllers know where they are through the network. The network would give the crew information that would help them avoid collisions. It would also allow information to be sent from aircraft to aircraft without having to go through ground facilities. The system could also be used to send safety warnings to aircraft. Using XML aviation services, aircraft operators could receive automatic updates of weather, landing conditions at the destination airport, turbulence ahead, and other information. Airborne Internet could be the means by which the aviation industry will realize these benefits by providing XML services capability to aircraft.

# Conclusion

Thus, this airborne internet technology has a wide range of utilities in the field of aviation services like aircraft monitoring and air traffic management, weather information etc., and also provides an opportunity for the passengers to access the internet at very high altitudes that is, in the aero planes and other conventional services. Thus, it is a further new trend in this mobile world which is establishing the connectivity by building network in the air.

**RECOMMENDATIONS**

1. This seminar paper recommends that every aircraft should establish an airborne internet is a tremendous opportunity for everyone.
2. With the help of an airborne Internet, each plane can transmit its identity, location, and also direct video footage that will help Homeland security fight against terrorism.
3. This paper also recommends that the airborne internet should be implemented by every flying company as it has the ability to connect airplanes not just via a computer on the ground (or via satellite) but directly with each other, relaying information from other planes in an Internet-like fashion.

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