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AIRBORNE INTERNET

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ABSTRACT: *Airborne Internet aims at providing communication link between aircraft-ground, ground-ground and aircraft-aircraft. The network is intended for use in aviation communication, navigation and surveillance (CNS) and would also be useful to businesses, private internet users and government agencies .The AI is a proposed network in all nodes would be located in aircraft. It is an internet broad band which provides high speed wireless internet connection by placing aircraft in fixed path over hundreds of cities. It a concept that adopts modern network theory and principles into the transportation reality, creating a system in which aircraft and people in transit will be connected with a scalable, general purpose, and multi-application aviation data channel.AI refers to installing a broadband network hub in an aircraft flying at 52000 to 69000 above level-high enough to be out of weather disturbances and way outside the flight envelope of commercial aircraft.*

KEY WORDS: Routing, Internet, Throughput, IP networks, aircraft, broadband, SATS, HOLA, satellite, hub, communications.

1. Introduction:

Airborne Internet is a private, secure and reliable aircraft communications that uses the same technology as the commercial internet. Now a days every users use the internet which is used to upload and to download data's like audio, videos, photos , etc. and these users are switching to cable modems and digital subscriber line to increase the bandwidth, where these lines are land lines and is physical type. With this there comes a new type of service being developed that will take broadband into the air which is called as "AIRBORNE INTERNET". This implementation is used to connect aircraft to a ground based internet access node, including the information which passed across the communication link. It is useful in providing information about weather, surrounding airspace environment and for aircraft-to-aircraft communication. Land-based lines are limited physically in how much data they can deliver because of the diameter of the cable. In airborne Internet, there is no such physical limitation, enabling a broader capacity. It provides an opportunity for the passengers to access the internet at very altitude that is in aero plane and in other conventional services. Airborne Internet began as a supporting technology for NASA's Small Aircrafts Transportation System. But there is no reason that A.I should be limited to SATS-class aircraft .

Components for installation:

1.External antenna.

2.Internet hub installed in aircraft.

2. What is an airborne internet?

a) Satellite internet access already at common place.
b) Satellites orbit at several hundreds of miles above earth.
c) Imagine airplane like device at approximately 60000 feet.
d) Aircraft will be undisturbed by inclement weather and will be flying well above commercial air traffic.

3. Why Airborne Internet ?

There are mainly two reasons for the development of Airborne Internet :

A) Need for a higher bandwidth:

The reason is related with the need for higher bandwidth. The computer most people use comes with a standard 56k modem, which means that in an ideal situation the computer would down streams at a rate of 56 kilobits per seconds. The speed is far slow to handle the huge streaming videos and music files that more consumers are demanding today. That's where the need for bigger bandwidth – broadband-comes in, allowing the greater amount of data to flow to and from the computer and this is achieve with the help of Airborne Internet.

- Around 1-5 mbps for Home Users
-Around 5-25 mbps for Business Users
-Around 25-155 mbps for Dedicated Users.

B) Small Aircrafts Transportation System:

- SATS controls traffic in air.
- Provides internet for people in transit.

4. Airborne Internet Workings:

At least three different methods have been proposed for putting communication nodes aloft. The first method would employ manned aircraft, the second method would use unmanned aircraft, the third method would use blimps. The nodes would provide air-to-air, surface-to-air, and surface-to-surface communication. The blimps would fly at altitudes of around 16km, and would cover regions of about 64km.

The principle behind the A.I. is to establish a robust, reliable, and available digital data channel to aircraft. Establishing the general purpose, multi-application digital data channel connection to the aircraft is analogous to the connection of a desktop computer to its local area network, or even the wide area network we call the Internet. But aircraft are mobile objects. Therefore, mobile routing is required to maintain the data channel connectivity while the aircraft moves from region to region. Mobile routing is the ability of a network user to move from one network to another without losing network connectivity. It has been developed and has matured to the point that it is ready to be applied to aviation. The current internet protocol (IP) is being replaced with a new version that includes provisions for security and mobile routing. It is specifically designed to accommodate the proliferation of wireless network devices that are easily transportable between networks. XML services, a standard way in which software interacts provide the opportunity for all information to be published as soon as it is available. This means the end user has the opportunity to receive near real time data, depending on the situation. XML is independent of the platform, operating system, or the device of the information source and the end user. Currently in aviation, very little information can be updated digitally during flight. At best, some information is updated using the analogue voice channel. 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.
The A.I Aircraft will house packet switching circuitry and fast digital network functions. The communications antenna and related components will be located in a pod suspended below the aircraft fuselage. To offer "ubiquitous" service throughout a large region, the antenna will utilize multiple beams arranged in a typical cellular pattern. Broadband channels to subscribers in adjacent cells will be separated in frequency. As the beams traverse over a user location, the virtual path through the packet switch will be changed to perform a beam-to-beam handoff.
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 is 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.
The Airborne Network will offer ubiquitous access to any subscriber within a "super metropolitan area" from an aircraft operating at high altitude. The aircraft will serve as the hub of the Airborne Network serving tens to hundreds of thousands of subscribers. Each subscriber will be able to communicate at multi-megabit per second data rates through a simple-to-install subscriber unit. The Airborne Network will be steadily evolved at a pace with the emergence of data communications technology world-wide.
An airplane specially designed for high altitude flight with a payload capacity of approximately one ton is being developed for commercial wireless services. It will circle at high altitudes for extended periods of time and it will serve as a stable platform from which broadband communications services will be offered. The High Altitude Long Operation (HALO) Aircraft will maintain station at an altitude of 52 to 60 thousand feet by flying in a circle with a diameter of about 5 to 8 nautical miles.

Three successive shifts on station of 8 hours each can provide continuous coverage of an area for 24 hours per day, 7 days per week. Such a system can provide broadband multimedia communications to the general public.
One such platform will cover an area of approximately 2800 square miles encompassing a typical metropolitan area. A viewing angle of 20 degrees or higher will be chosen to facilitate good line-of-sight coverage at millimeter wave (MMW) frequencies (20 GHz or higher). Operation at MMW frequencies enables broadband systems to be realized, i.e., from spectrum bandwidths of 1 to 6 GHz. MMW systems also permit very narrow beamwidths to be realized with small aperture antennas. Furthermore, since the aircraft is above most of the earth's oxygen, links to satellite constellations can be implemented using the frequencies overlapping the 60 GHz absorption band for good immunity from ground-based interference and good isolation from inter-satellite links.
The A.I Network can utilize a cellular pattern on the ground so that each cell uses one of four frequency sub-bands, each having a bandwidth up to 60 MHz each way. A fifth sub-band can be used for gateways (connections to the public network or dedicated users). Each cell will

cover an area of a few square miles. The entire bandwidth will be reused many times to achieve total coverage throughout the 2800 square mile area served by the airborne platform. The total capacity of the network supported by a single airborne platform can be greater than 100Gbps.

The Airborne Network provides an alternative to satellite- and ground-based systems. Unlike satellite systems, however, the airborne system concentrates all of the spectrum usage in certain geographic areas, which minimizes frequency coordination problems and permits sharing of frequency with ground-based systems. Enough power is available from the aircraft power generator to allow broadband data access from small user terminals.

DESIGN OPTIONS FOR ANTENNAS:

The Airborne Network will use an array of narrow beam antennas on the Airborne Aircraft to form multiple cells on the ground. Each cell covers a small geographic area, e.g., 4 to 8 square miles. The payload is liquid-cooled and operates off of about 20 kilowatts of DC power. An 18-foot dish underneath the plane is responsible for reflecting high-speed data signals from a ground station to our computer. The wide bandwidths and narrow beam widths within each beam or cell are achieved by using MMW frequencies. Small aperture antennas can be used to achieve small cells. For example, an antenna having a diameter of only one foot can provide a beam width of less than three degrees. One hundred dish antennas can be easily carried by the Airborne Aircraft to create one hundred or more cells throughout the service area. If lensed antennas are utilized, wider beams can be created by combining beams through each lens aperture, and with multiple feeds behind each lens multiple beams can be formed by each compound lens.

The major design options for antennas in the Communications Payload are to utilize either platform-fixed beams or earth-fixed beams.

5.Network Architecture:

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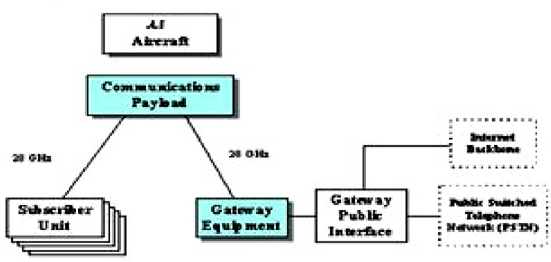
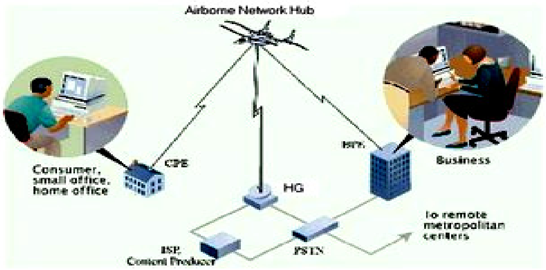


Block Diagram Representation of Airborne Internet Network Architecture.

At the apex of a wireless Cone of Commerce, the payload of the Airborne Aircraft becomes the hub of a star topology network for routing data packets between any two subscribers possessing premise equipment within the service coverage area. A single hop with only two links is required, each link connecting the payload to a subscriber. The links are wireless, broadband and line of sight Information created outside the service area is delivered to the subscriber's consumer premise equipment ("CPE") through business premise equipment ("BPE") operated by Internet Service Providers ("ISPs") or content providers within that region, and through the Airborne Gateway ("HG") equipment directly connected to distant metropolitan areas via leased trunks. The HG is a portal serving the entire network. It avails system-wide access to content providers and it allows any subscriber to extend their communications beyond the Airborne Network service area by connecting them to dedicated long-distance lines such as inter-metro optical fiber.
The CPE, BPE and HG all perform the same functions: use a high-gain antenna that automatically tracks the Airborne Aircraft; extract modulated signals conveyed through the air by millimeter waves; convert the extracted signals to digital data; provide standards-based data communications interfaces; and route the digital data to information appliances, personal computers, and workstations connected to the premise equipment. Thus, some of the technologies and components, both hardware and software, will be common to the designs of these three basic network elements



The Airborne Network Architecture

The CPE, BPE and HG differ in size, complexity and cost, ranging from the CPE which is the smallest, least complex, lowest priced and will be expressively built for the mass market; followed by the BPE, engineered for a medium size business to provide access to multiple telecommuters by extending the corporate data communications network; to the HG which provides high bandwidth wireless data turning to Wide Area Networks ("WANs") maintained and operated by the long distance carriers and content handlers who wish to distribute their products widely.
In other words, the CPE is a personal gateway serving the consumer. The BPE is a gateway for the business requiring higher data rates. The HG, as a major element of the entire network, will be engineered to serve reliably as a critical network element. All of these elements are being demonstrated in related forms by terrestrial 38 GHz and LMDS vendors.

6.Principles of Airborne Internet :

a) It uses TCP/IP protocol
b) It uses the network called HALO (HIGH ALTITUDE LONG OPERATAION)
c) Mobile routing –is an ability of a network user to move from one network to another without losing connectivity.

7. Features:s

a) Airborne Internet is seen as perfect answer to the demand for fast, reliable access to internet.
b) Increase innovation.
c) Increase security, reliability and scalability.
d) Enhanced user connectivity globally.
e) It helps to achieve a broader bandwidth.
f) It has the potential to provide cost savings for aircraft operators.
g) It helps to avoid the connectivity down time of people in transit

8.Applications :

a)Downloading and uploading the speed of data through it increase.
b)It is used to track aircraft for the air traffic control system.
c)Using XML aviation services, aircraft operators could receive automatic updates of weather landing condition with the destination port, turbulence ahead.

9.Advantages :

a) Increase productivity and economic growth:
The growth in connectivity will enable higher volume aircraft operations and allow people in transit to use otherwise unproductive time.
b)Lower cost :
Flight deck functions in the aircraft will be consolidated and the number of required radius will be reduced, which will save aircraft owners money in addition to weight and space.
c)Increase security, reliability and scalability.
d) Reduced risk.
e) Increase innovation.
f) Increase flexibility.

10.Conclusion :

Airborne Internet is about information connectivity. This technology has a wide range of utilities in the field of aviation services like aircraft monitoring, weather information, etc.it also provides an opportunity for the passengers to access the internet at a very high altitudes that is in aero plane. It is a further new trend in this mobile world which is establishing the connectivity by building network in the air.

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