

Worldwide Interoperability for Microwave Access Integrated Network Server

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Abstract

The Worldwide Interoperability for Microwave Access (WiMAX) integrated network server includes an Access Service Network Gateway (ASN-GW), an Authentication Authorization Accounting (AAA) connected to the ASN-GW, and a Home Agent (HA). The ASN-GW follows the WiMAX standard, manages a mobile station connected to a base station, and provides connection paths connected to a network. The AAA authenticates the mobile station to be connected to the network. The HA provides a Mobile IP service to guarantee the mobility of the mobile station. The WiMAX integrated network server includes a separate data processing unit, which makes it possible to rapidly process data. The WiMAX integrated network server can independently manage communication among the mobile stations connected thereto, separately from an external network. The WiMAX integrated network server does not require additional equipment, which reduces the installation space and costs.

1. Introduction

Worldwide Interoperability for Microwave Access (WiMAX) defines WiMAX communication network architecture based on wireless data transmission technology according to IEEE 802.16 standard.

In the WiMAX communication standard, mobile stations can be connected to a mobile communication network via communication systems, such as a base station, an Access Service Network Gateway (ASN-GW), an Authentication Authorization Accounting (AAA), a Home Agent (HA), etc. That is, mobile stations are connected to a mobile communication network via a base station and an ASN-GW.

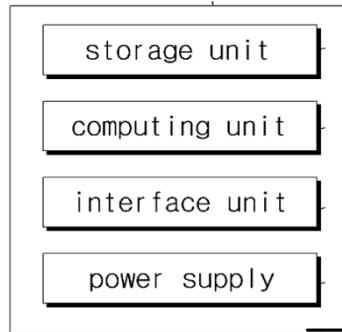


Fig. 1: illustrates hardware unit of a WiMAX integrated network server.

The base station controls wireless resources of mobile stations and the ASN-GW manages the connection with base stations, and authentication/billing, data communication, information, etc., of mobile stations. The AAA serves to process subscribers' authentication, authorization, and billing, etc. The AAA authenticates and authorizes a mobile station connected via the ASN-GW, so that the mobile station can be connected to a mobile communication network. The AAA also manages the billing of the mobile station connected to the mobile communication network. The HA serves to allocate and manage fixed IPs for mobile stations and to perform a data routing operation, based on mobile IP technology.

In order to connect to a mobile communication network and smoothly provide services to users, the mobile stations require using the WiMAX communication systems described above. However, each of the WiMAX systems is expensive and so large in volume that it is restricted by the installation space, which causes difficulties in providing an in-building service.

2. Specifications

1. Spectrum Usage: 3.5 GHz
2. Capacity: 0.17-0.7 & 2.8-11.3 Mbps
3. Max Range: 0.3km to 50km
4. Types: LOS(Line Of Sight) & NLOS(Non-Line Of Sight)

3. Description

1. A WiMAX integrated network server comprises of an Access Service Network Gateway (ASN-GW) following the WiMAX standard, managing a mobile station connected to a base station, and providing connection paths connected to a network; and an Authentication Authorization Accounting (AAA) connected to the ASN-GW, for authenticating the mobile station to be connected to the network.

2. The WiMAX integrated network server, further comprises of a Home Agent (HA) for providing a Mobile IP service to guarantee the mobility of the mobile station.
3. A computing unit for performing computation to operate the functions of the ASN-GW and the AAA; a storage unit for storing information to execute the ASN-GW and the AAA; an interface unit for communicating with an external device; and a power supply for supplying electric power to the computing unit, the storage unit, and the interface unit is also included.
4. A hardware unit comprises of hardware components including an interface unit connected to an external device; an operating system for processing signals, input via the hardware unit, on the hardware unit, and controlling and managing the hardware unit; and an application unit including an Access Service Network Gateway (ASN-GW) and an Authentication Authorization Accounting (AAA), wherein the ASN-GW manages a mobile station connected to a base station and provides connection paths connected to a network, on the operating system, according to the WiMAX standard, and the AAA authenticate the mobile station.
5. The application unit further comprises of a Home Agent (HA) for providing a Mobile IP service to guarantee the mobility of the mobile station.
6. The data processing unit for data, input via the hardware unit, on the hardware unit, wherein the data processing unit transfers the processed data to an external device, without passing through the operating system.
7. The mobile stations are connected to the network generates data and directly transfers it to another via the application unit.

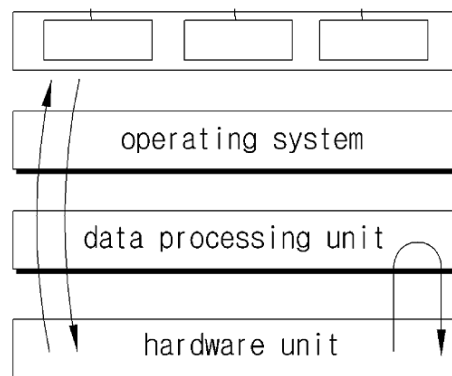


Fig. 2: is a schematic block diagram illustrating a WiMAX integrated network server.

The WiMAX integrated network server includes a hardware unit, a data processing unit, an operating system, and an application unit.

The hardware unit, as shown in Fig. 1, includes a storage unit, a computing unit, an interface unit, and a power supply. It serves to perform a physical computation in the WiMAX integrated network server.

The storage unit stores information to assist the operating system and the application unit.

The computing unit performs a computing process using the information stored in the storage unit and executes the functions of the operating system and the application unit.

The interface unit serves to communicate with external devices. It can perform communication based on various communication standards. It can allow the WiMAX integrated network server to be connected to a plurality of base stations and a plurality of mobile stations. It can also allow the WiMAX integrated network server to be connected to the Internet or a mobile communication network.

The power supply supplies electric power to the storage unit, the computing unit and the interface unit.

The data processing unit processes data received via the hardware unit and directly outputs it to an external device via the interface unit, without requiring the operating system. That is, unlike signal packets processed by the application unit and the operating system, the data packets are directly processed by the layers lower than the operating system, thereby increasing the data processing speed.

The operating system is installed to the upper layer of the data processing unit. The operating system controls and manages the entire operation of the hardware unit and processes signals input via the hardware unit. The operating system transfers the processed signals to the application unit or to an external device via the interface unit of the hardware unit. If control packets or signal packets that cannot be processed by the data processing unit are transferred to the operating system via the data processing unit, the operating system processes the control packets or signal packets to meet the function of the application unit and then transfers them to the application unit.

The hardware unit receives various types of packets. The signal packets are processed by the application unit, via the operating system. The data packets are rapidly processed by the data processing unit, without passing through the operating system.

Since the data processing unit processes only data without the assistance of the operating system and the application unit, it can rapidly provide a data processing service to the mobile station.

The operating system can be implemented with one of the software operating systems, for example, Microsoft Windows, Linux, etc. In an embodiment of the present invention, the operating system is implemented with Linux.

The application unit can allow for the installation of a variety of application programs. In an embodiment of the present invention, an Access Service Network Gateway (ASN-GW), an Authentication Authorization Accounting (AAA), and a Home Agent (HA) are installed to the application unit.

The ASN-GW manages connection between the lower layer and a plurality of base stations. In particular, the WiMAX integrated network server is installed to an in-building, the ASN-GW manages base stations placed in the building and is operated according to the WiMAX standard. The ASN-GW manages a plurality of connected mobile stations, provides connection paths for network, routes packets, and performs a handover of a mobile station between base stations.

In addition, the ASN-GW performs authentication, authorization, billing service, etc. The ASN-GW can control the flow of the services, the mobility of a mobile station, and the quality of service provided to the mobile station.

The AAA performs an authentication process allowing a mobile station to be connected to a network. The AAA serves to authenticate the subscriber of a mobile station. The AAA serves as an EAP-TLS/TTLS/AKA/SIM server via the remote authentication dial-in user service (RADIUS) protocol or DIAMETER protocol.

The HA provides a mobile IP of a mobile station with respect to a WiMAX node. The HA manages a Proxy Mobile IP (PMIP) and a Client Mobile IP (CMIP), and performs an IP-in-IP encapsulation.

In an embodiment of the present invention, the WiMAX integrated network server conducts OAM functions, such as Status, Alarm, Statistics, Fault, Loading, Configuration, Call Trace, Diagnostics, etc.

Since the Access Service Network Gateway (ASN-GW), the Authentication Authorization Accounting (AAA), and the Home Agent (HA) are operated in an application under one hardware based operating system, the WiMAX integrated network server can be implemented as one system.

Although the embodiment of the present invention is implemented in such a way that the application unit includes the ASN-GW, the AAA, and the HA, it should be understood that the present invention is not limited to the embodiment. For example, the application unit can further include other units since they can be implemented as applications. In addition, the application unit can include at least one or more from among the ASN-GW, the AAA, and the HA.

Since the WiMAX integrated network server includes the ASN-GW, it can provide a wireless WiMAX service, by cooperating with base stations.

As shown in Fig. 3, if the first mobile station transmits data to the second mobile station where the first and second mobile stations are connected to the lower layer of the first WiMAX integrated network server, the first WiMAX integrated network server receives the data from the first mobile station and directly transfers it to the second mobile station, without transferring it to the Internet or a mobile communication network. That is, the mobile stations, connected to the lower layer of the WiMAX integrated network server, can perform communication, for example, data transmission, with each other.

Therefore, one WiMAX integrated network server, installed to an intranet, an LAN, etc., can serve to construct an independent network, without requiring an external Internet or a mobile communication network. In that case, mobile stations can

communicate with each other via the independent network, without using an external switch, an ISP service, etc.

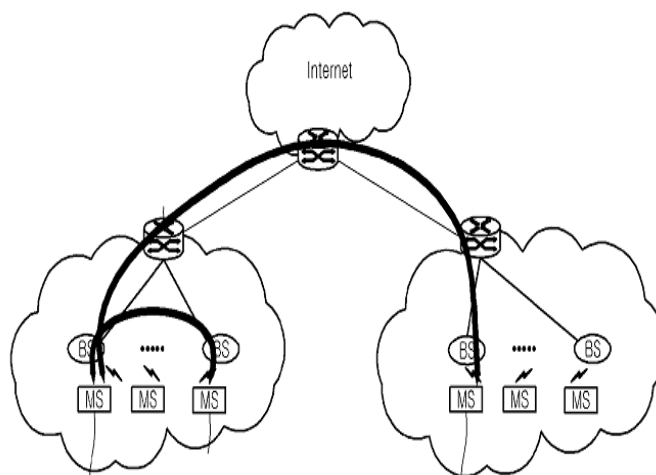


Fig. 3: a view illustrating a communication network including a WiMAX integrated network server according to an embodiment of the present invention.

On the other hand, if the first mobile station, connected to the lower layer of the first WiMAX integrated network server, makes a call to the third mobile station, connected to the lower layer of the second WiMAX integrated network server, or vice versa, they must perform communication via the Internet or a mobile communication network.

As described above, since the network server, according to the present invention, integrally includes the authentication unit for authenticating the ASN-GW and a mobile station, it can reduce equipment occupying a relatively large space, thereby acquiring a space advantage and reducing costs.

Since the network server includes a separate data processor for processing data, it can directly process data packets without passing through the operation system, thereby increasing the data processing speed.

Since the lower end of the WiMAX integrated network server can establish an independent network, it can be used as an intranet, a LAN, etc., which increases the communication speed.

Although exemplary embodiments of the present invention have been described in detail hereinabove, it should be understood that many variations and modifications of the basic inventive concept herein described, which may appear to those skilled in the art, will still fall within the spirit and scope of the exemplary embodiments of the present invention as defined in the appended claims.

4. Summary

The present invention solves the above problems, and provides a Worldwide Interoperability for Microwave Access (WiMAX) integrated network server following the WiMAX standard, which is not restricted by space due to its size and is cost efficient.

In accordance with an exemplary embodiment of the present invention, there is provided a WiMAX integrated network server including: an Access Service Network Gateway (ASN-GW) following the WiMAX standard, managing a mobile station connected to a base station, and providing connection paths connected to a network; and an Authentication Authorization Accounting (AAA) connected to the ASN-GW, for authenticating the mobile station to be connected to the network.

Preferably, the WiMAX integrated network server may further include a Home Agent (HA) for providing a Mobile IP service to guarantee the mobility of the mobile station.

Preferably, the WiMAX integrated network server may further include: a computing unit for performing computation to operate the functions of the ASN-GW and the AAA; a storage unit for storing information to execute the ASN-GW and the AAA; an interface unit for communicating with an external device; and a power supply for supplying electric power to the computing unit, the storage unit, and the interface unit.

In accordance with another exemplary embodiment of the present invention, there is provided a WiMAX integrated network server including: a hardware unit comprised of a plurality of hardware components including an interface unit connected to an external device; an operating system for processing signals, input via the hardware unit, on the hardware unit, and controlling and managing the hardware unit; and an application unit including an Access Service Network Gateway (ASN-GW) and an Authentication Authorization Accounting (AAA). The ASN-GW manages a mobile station connected to a base station and provides connection paths connected to a network, on the operating system, according to the WiMAX standard, and the AAA authenticate the mobile station.

Preferably, the application unit further includes a Home Agent (HA) for providing a Mobile IP service to guarantee the mobility of the mobile station.

Preferably, the WiMAX integrated network server may further include a data processing unit for data, input via the hardware unit, on the hardware unit. The data processing unit transfers the processed data to an external device, without passing through the operating system.

Preferably, one of a plurality of mobile stations connected to the network generates data and directly transfers it to another via the application unit.

References

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