

Evolution of the IEEE802 Series BWA System

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Abstract

This paper introduces the evolution of WiFi and WiMAX, which are the 802 series BWA (Broadband Wireless Access) architectures, together with the IEEE802.11 and 802.16e standardizations trends and the solution plans of NEC.

Keywords

BWA, OFDM, multipath fading, WiFi, broadband wireless LAN, WiMAX

1. Introduction

The FMC (Fixed-Mobile Convergence) and mutually corresponding networks are essential components for the Ubiquitous society based on the next generation network (NGN). As implementation of a low-cost broadband wireless access system has become necessary, the trend toward standardization of the BWA for high-speed IP packet services has become more active than ever. The addition of high-speed IP packet services to the mobile communications services requires the introduction of IEEE802 series wireless access systems to be standardized as well as further evolution of the traditional systems. The practicality and future perspectives of such wireless access systems are currently attracting much attention.

2. Communications Methods for the Mobile Environment

One of the biggest issues of high-speed data transmission in the mobile environment is how to overcome multipath fading. Since frequencies rise following an increase in the speed, the OFDM attempts to reduce the effects of multipath fading by narrowing the width of each carrier signal. The CDMA attempts to achieve the same purpose by diffusing the wave and performing rake reception of the signal with delay due to multipath as a separate signal. However, as the required bandwidth expands following the increase in the data transmission speed, use of the multi-carrier CDMA (MCCDMA) is considered for the 3GPP2. The IEEE802 series already decided from the beginning on the use of the OFDM, and the 3GPP also decided on the use of the OFDM in downlink access with the 3GLTE.

Fig. 1 shows the evolution of the physical layer and MAC layer of the data transfer.

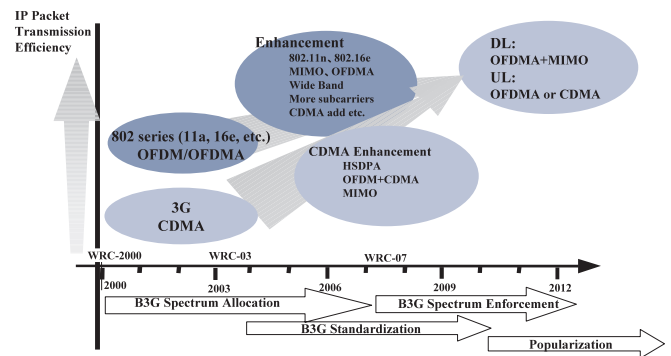


Fig. 1 Evolution of physical layer and MAC layer.

3. Trends of IEEE802.11 Products

With regard to the IEEE802.11 standards, the trend of 802.11n in achieving a high throughput of more than 100Mbps has long been attracting attention, but consensus has not been reached due to the large differences in the expectations of the advanced chip vendors, home appliance/PC manufacturers and handset manufacturers. The draft proposal was eventually approved at the general meeting held in Jan. 2006, and it is at present expected that the 11n products will be connected in the future to the formation of the information home appliance market under the leadership of the home appliance manufacturers.

On the other hand, the WiFi equipment for use in broadband wireless LANs is being subjected to severe functional requirements from the viewpoint of a reduction in operator investment costs and improvements in wireless resource utilization efficiencies. With the MOBILINK series, the logical network sharing (virtual AP) function based on the VLAN technology is incorporated in the APs and a policy server is introduced for

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dynamic wireless resource management on a per-VLAN basis. Although the QoS control in the wireless LAN Layer 2 has already been standardized in 802.11e, there is no special definition on the relationship with the resource securing necessitated by actual services and higher-level applications. As a result, how to connect dynamic resource requests to the QoS control of 11e becomes an important issue in packaging. We will therefore study the policy arbitration with the higher-level networks and linkage with the authentication server by taking the NGN into full consideration.

Fig. 2 shows the concept of dynamic resource management.

4. Development of IEEE802.16 Products

With regard to the 802.16 technology, the 802.16-2004 was approved as the standard for fixed systems in 2004. Then the draft plan for 802.16e was agreed upon as the mobile system standard at the end of 2005 and integrated with 16-2004 for re-standardization as the 16-2005 standard. Later on, in the WiMAX Forum held in Feb. 2006, the approval items for the Mobile WiMAX were arranged.

We at NEC are also developing WiMAX-compliant products following the Forum and the standardization trends. We be-

lieve that, even when the products for fixed networks are the targets, it will be possible to assure the superiority of the OFDMA in over-the-horizon communications as well as a flexible extension to mobility services by fabricating them based on 802.16e(-2005).

For the WiMAX network, the IEEE802.16g makes a complicated network proposal by considering the 3GPP network. However, since the required circuit quality and network configurations are variable depending on the type of the higher-level service, we think that scenario proposals per operator will be required with actual WiMAX products. Namely, when an operator has existing infrastructures, it is important to implement only the required functions and add them to the existing network and we recognize that what is expected for NEC is to propose a scenario for migration to the NGN. More specifically, we are planning to develop seamless connections between dissimilar networks and to enable full mobility based on combining the existing simple mobility and the MIP (Mobile IP) functions of 16e.

Fig. 3 shows the WiMAX network configuration plan.

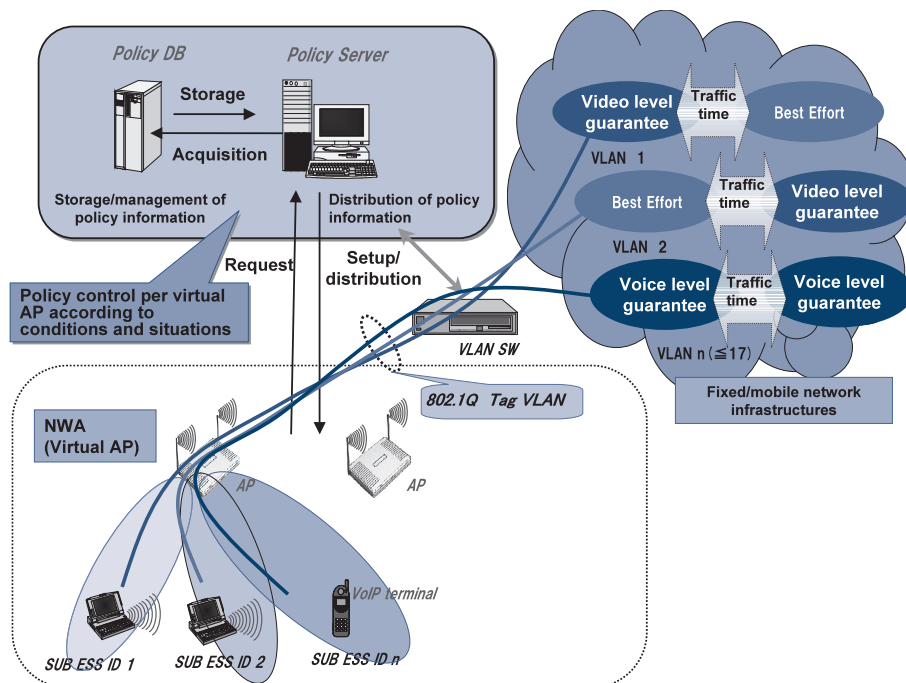


Fig. 2 Dynamic resource management.

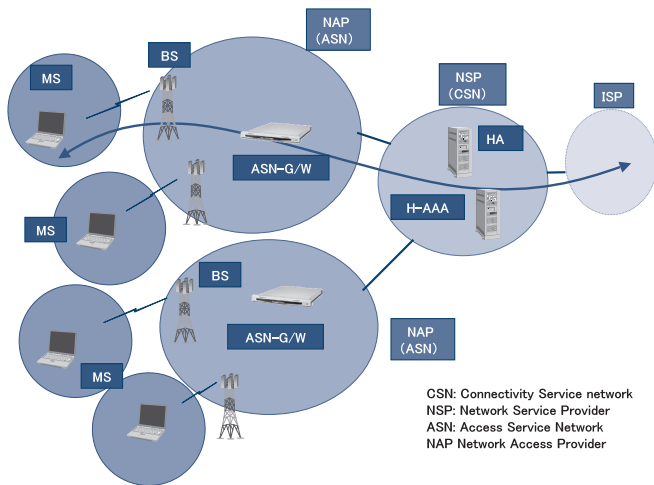


Fig. 3 WiMX network configuration plan.

5. Conclusion

Wireless access equipment is attracting attention as it enables mutual compatibility between fixed and mobile communication systems in the NGN. At NEC, we will continue the development of systems based on the IEEE802 wireless technology aiming at complementing the areas between dissimilar wireless systems and enable high-speed IP packet services at low prices.

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