Voice Service Architecture in IMT-2000 using Voice Gateway

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Abstract: This paper proposes a new voice service network architecture for initial IMT-2000 and describes the features of Voice Gateway which is a core entity of the proposed architecture. Also describes a system configuration of the prototype of the proposed architecture and software configuration of Voice Gateway in the prototype.

1. Introduction

Most existent mobile networks are switch based networks because switch based networks are more suitable to efficiently provide the dominant services of existent networks; voice service and low speed data services(lower than 64 Kbps). But the most important service of the IMT-2000 is high speed data service, say, 384Kbps packet service. An IP/server based distributed network is believed to be more suitable than a switch based network for this service. Therefore it is important to find the most efficient way to combine these two different networks in the initial IMT-2000 stage because in the initial stage, voice service will be still one of the dominant services.

This paper proposes a new voice service network architecture for initial IMT-2000 and describes the features of Voice Gateway which is a core entity of the proposed architecture. Also this paper describes a system configuration of the prototype of the proposed architecture and software configuration of Voice Gateway in the prototype with some evaluation result.

2. Network Architecture

Fig.1 shows the configuration of the proposed network. The left side shows the existing network (for example, cdmaOne network, hereafter called 2G) and the right side shows the new distributed network for high speed data services(for example, cdma2000 network, hereafter called 3G).

As seen in the Fig.1, a Voice GateWay (hereafter called VGW) is the proposed core entity to combine the two networks. The features of the VGW are the following:

(1) Abis Interface translation
The interfaces of BTS/BSC in 2G(i.e. Abis interface) and 3G are different. So VGW should translate all different interfaces. It translates all call control messages by simulating voice call state transition..

(2) ATM translation
It also deals with the ATM interface because 2G usually don't use ATM capability fully but 3G will use ATM capability from the very initial stage. Especially in the case of voice service, ATM function to support AAL-2 is indispensable. So VGW terminates / generates AAL-2 for voice traffic and at the same time it has the function of AAL-5 for call control signaling.

(3) Integrated operation
VGW should provide the operator with a way to manage the network easily. So VGW manages all resources by unified interface, MO (Managed Object)interface defined in TMN and NM forum.

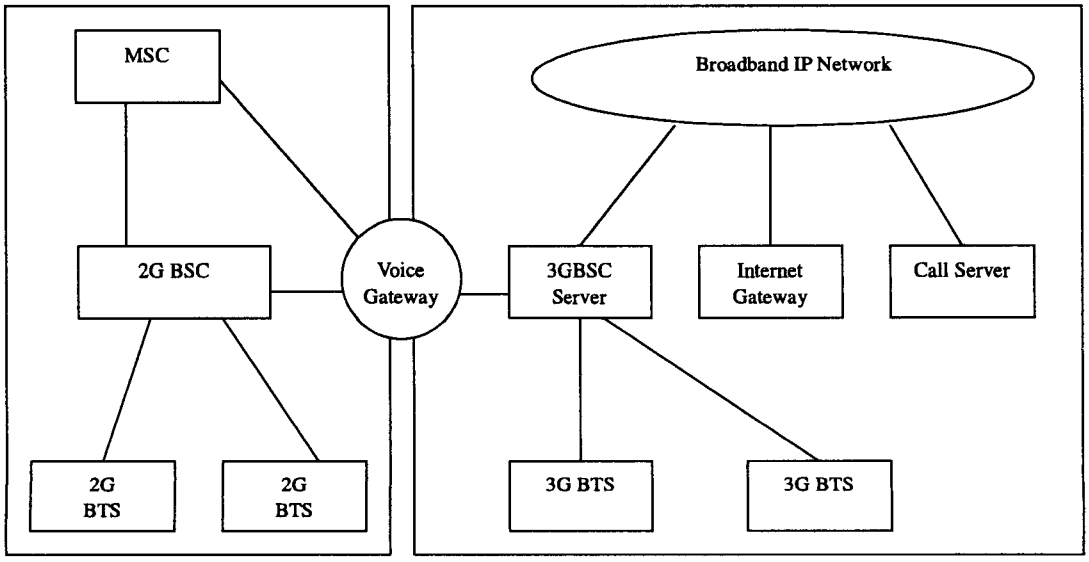

Fig.1 Proposed Voice Service Architecture

3. Prototype

3.1 System Configuration

In order to validate the proposed network architecture, a prototype has been developed. Fig.2 shows the system configuration of the prototype.

For 2G-net, 2G existing BSC and MSC are only connected to the V GW to reduce system complexity. For 3G-net, 3G BTS simulators and 3G BSC server have been newly developed and connected to the V GW. Also Ethernet is used to connect other service specific entities (e.g. Internet Gateway to validate high speed packet data service).

3.2 Software Configuration of VGW

Fig.3 shows the software configuration of the VGW in the prototype. To develop easily, general purpose platform (Lynx OS, MPC hardware) have been selected and high-level software development tools based on object-oriented methodologies have been applied (e.g. automatic program generation).

In Fig.3, three objects (call control, ATM control, OAM) are main portions to realize the features of VGW. Call control object realize the Abis interface translation function and also the call control function to manage simultaneous voice and data service. ATM control object realize the ATM translation function and will be described in more detail in the following section.

The OAM object realize the unified operation function to provide the easy handling interface to the operator.

3.3 ATM Processing

About ATM processing, two issues (control signal translation and voice traffic translation) should be handled. About the control signal translation, VGW has to provide multiple User to Network Interface(UNI) control channel over the SSCOP, because VGW combines multiple control channels of 3G BTS simulator to one 2G BSC. Thus, we have extended multi-channel access function over the SSCOP protocol.

For the traffic translation, since the prototype 2G BSC system uses AAL5 and some proprietary address scheme, there are 2 issues such as AAL type translation and ATM address mapping.

Regarding the AAL translation, two approaches are available. Firstly, UDP/IP can be introduced between VGW and 3G BSC Server. Each voice packets carried by AAL-2 are terminated at 3G BSC Server, translated into UDP/IP, vise versa. In VGW, UDP/IP packet translated into AAL5 packet vise versa. Secondly, voice packets carried by AAL-2 can be translated into AAL-5 directly by using AAL-0 in VGW, vise versa. In this prototype of VGW, we have adapted first approach.

Regarding the ATM address mapping, we have

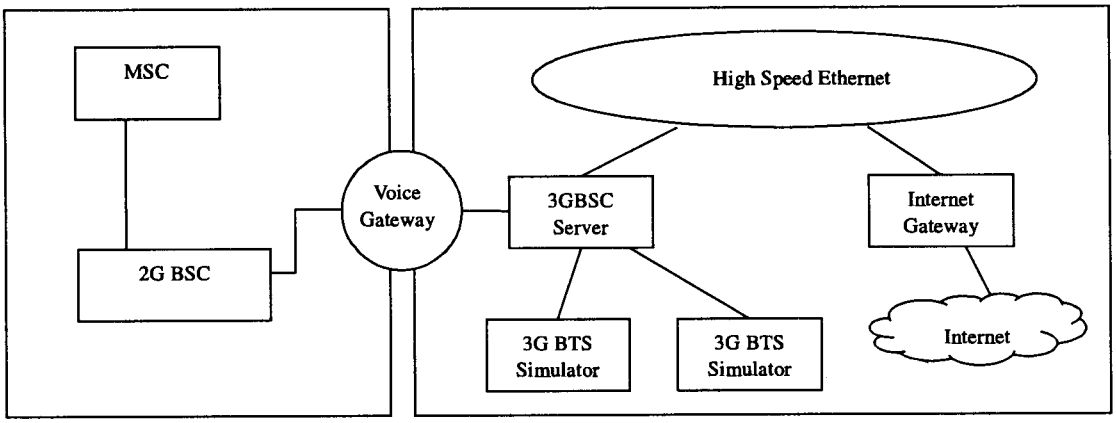

Fig.2 System Configuration of Prototype

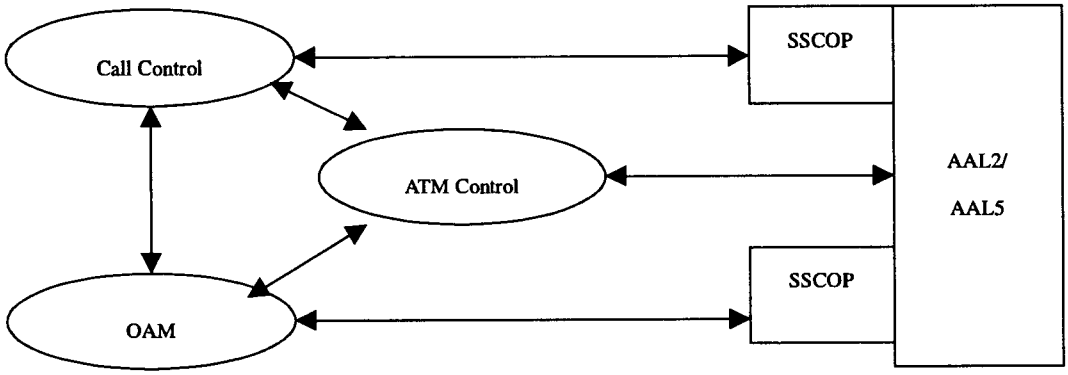

Fig.3 Software Configuration of Voice Gateway

drown address mapping rule by analysis of relationship between AAL-2 packet's CID value range and traffic channel id range. Based on this rule, we have setup database including ATM addresses, UDP port ids, CID number. This address mapping is performed during traffic channel setup signaling.

3.4 Evaluation Result

The basic voice service connections (i.e. Mobile to mobile terminal, Land terminal to mobile terminal) have been realized on the above prototype and the voice connections have been validated. 10 mobile terminals are connected to 3G BTS simulators and land terminals are connected to MSC through PBX.

Based on this result, it can be said that the proposed network architecture has been validated for voice service and the basic design of VGW has been also validated.

4. Conclusion

In this paper, a new voice service network architecture for initial IMT-2000 has been proposed which is suitable for smooth migration from 2G to 3G. Also the features of VGW have been shown which is a core entity of the proposed architecture. The system configuration of the prototype to validate the proposal architecture and software configuration of the VGW have been described with some detailed description about ATM processing.

Basic voice call connections have been validated on the prototype system. So we plan to evaluate performance aspect to confirm the feasibility of the proposal.

References

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