

DBS 시스템에서 효율적인 자원 관리를 위한 RRMC 구현에 관한 연구

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요 약

디지털 위성방송 시스템은 송신국, 자원 및 가입자 관리 시스템, 수신기로 구성된다. 자원 및 가입자 관리 시스템은 자원 관리 모듈, 사용자 인터페이스 모듈, 송신국 인터페이스 모듈, 수신기 인터페이스 모듈, 가입자 판매 모듈, 감시 및 제어 모듈로 구성이 된다. 본 논문에서는 클라이언트/서버를 기반으로 한 디지털 위성 방송 시스템에서 효율적인 자원 및 가입자 관리를 위한 새로운 RRMC 알고리즘을 제안하고 이를 통한 시스템의 실시간적인 감시 및 제어 기능 구현에 관하여 기술하였으며 또한 자원 및 가입자 관리 시스템과 다른 장비와의 통신 절차에 대해서도 함께 기술하였다.

A Study on the RRMC Implementation for the Efficient Resource Management in DBS System

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ABSTRACT

The Digital Broadcasting Satellite System consists of the Transmitter station, the Resource and Subscriber Management System, and the Receiver Test Unit. The RSMS consists of several modules such as Resource Main Module, Resource User Interface Module, Transmitter Station Interface Module, Receiver Test Unit Interface Module, Subscriber Sales Outlets Module and Monitor & Control Module. In this paper we suppose the new RRMC Algorithms that is to manage efficiently the Resource and subscriber information in the Direct Broadcasting Satellite system based on client-server features and demonstrates the implementation method of monitoring and control the system in real time. Also we explain the communication procedure between resource and subscriber management and other equipment.

1. Introduction

The Digital Broadcasting Satellite (DBS) System has been broadcasting TV programs through a Transmitter Station, over KOREASAT DBS Transponders,

to large numbers of small, relatively low cost home receivers since July 1996. The DBS accepts audio, video and data program from various source and encodes them into MPEG-2 TS(transport) Stream. Input formats for audio and video may be either analog or digital. Inputs for the data service intended for distribution to subscribers are asynchronous unidirectional RS-232C at up to 19.2 kbps and synchro-

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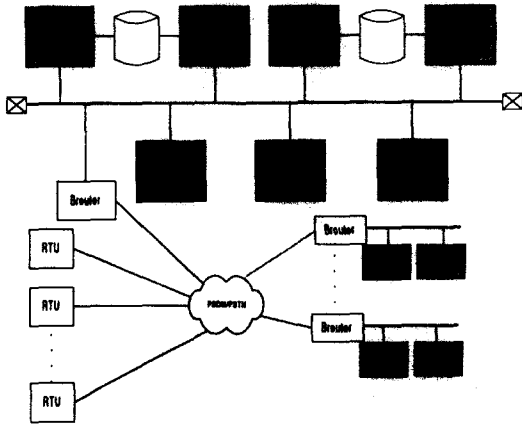
nous unidirectional RS-449 up to 2 Mbps. The data service will be used for data distribution services. The DBS system consists of transmitter station, receiver, and RSMS(Resource and Subscriber Management System)[1, 2]. The RSMS controls and monitors subscriber access to the Receiver Test Unit[3, 4]. The program contents are generated externally to the DBS system. The RSMS controls subscriber access to the programming and collects subscriber usage information. The RSMS supports a single service provider offering services using up to six transmitter stations. There was only one RSMS and it may or may not be co-located with a Transmitter Station. As a user capability, in the DBS system there are four classes of operators: subscription operator, program operator, transmitter station operator and system operator. The RSMS controls program related with all TV programs and data program that will be delivered over the DBS system in the next two weeks. The RSMS system has a subscriber profile for each subscriber who has been issued a smart card. This profile contains the subscriber serial number, address, channel authorization descrambling information and individual security access code. The RSMS system will extract the usage information from the smart card and update the associated subscriber profile. Non-responding Receiver Test Units(RTUs) will be reported to the system operators by the RSM so that they may take an appropriate action. The RSMS User Interface provides the RSMS operators with a man-machine interface designed to meet human engineering performance requirements and compatible with the skill levels of the RSMS operators. Before the RSMS operator enters system operation, operator should be well known about the techniques and features. To improve operating performance and reduce operator overhead, we use commercial products for developing the user interface and widgets [5, 6, 7]. The RSMS will offer a unique interface to all three RSMS operators. All three interfaces are offered on the locally located RSMS terminals. The Subscription op-

erator interface is also offered on the Sales and Subscriber Outlet Terminal(SSOT). The Subscription operator user interface will provide the operator with the ability to display, create and modify the subscriber profile or usage records. Also The interface provides the subscription operator with the ability to manage the flow of information between the RSMS and the subscriber's smart card. The interface will be easy to use point and click type interface. The program operator user interface is offered on the RSMS terminal and will allow the operator to create, modify and display the program guide information. The interface will be easy to use point and click type interface. The system operator user interface is offered on the RSMS terminal and will allow the operator to perform system administration type functions such as an account management, archiving management, backups. The interface will be a fully functional style command-line interface. Especially in this paper we describe the RRMC which is display and report each platform status information and change the configuration information of DBS system in real time. The Logical Configuration of the RSMS will be described in the section II. Also the information about the logical interface and function of each module in the RSMS will be described in Section II. The S/W Design Scheme and Environment for RRMC (Real Time RSMS Monitoring and Control) will be specified in the section III. The Implementation of RRMC Algorithms will be given in the section IV. In section V, conclusion will be described.

2. The Logical Configuration of the RSMS

The RSMS Logical Interface is described in Fig 1 and its function on each module is explained in reference[8] and [9]. The RSMS System Manager Terminal (RMT) provides the system operator user interface for the RSMS System Manager(RSM). The interface provides the system operator with all the necessary

function to manage the RSM computer network and the RSM application software.



(그림 1) Logical Configuration of RSMS
(Fig. 1) RSMS의 논리적 구성도

The Program Manager(PGM) provides the program operator user interface for the RSM. The interface provides the program operator with necessary function to manage the content of the program guide.

The RSMS to SSOT Manager(RSS) provides the interface between the RSM and the SSOTs(Subscriber Sales Outlet Terminal) distributed throughout the DBS service area.

The Database Manager(DBM) provides database service to the RSMS. All permanent information, data and records are authoritatively maintained by the DBM.

The RSMS Access Manager (RAM) and Transmitter Access Manager (TAM) provides the interface between the RSM and the Transmitter Station (TS) Baseband equipment. The RAM is located in the RSM operation facility and it is responsible for managing and distributing the entitlement management message, program guide information and receiver command message to the TAM's located in Transmitter Station. RAM regularly queries the DBM to extract current information necessary to construct the entitlement management and program guide message

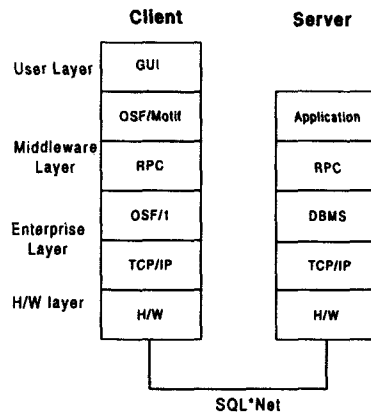
streams. Receiver command message are received from RRM(RSMS to RTU Manager). TAM is co-located with each TS and it is responsible for managing control words, generating entitlement control message and combing each message stream to generate an RSMS DATA STREAM.

The RRM provides the interface between the RSM and RTU's and it uploads usage data from RTU to RSM.

3. S/W Design Scheme and Environment for RRMC

The RRMC software design is based on the client/server model specified in Fig 2.

In Fig 2, Ethernet has been used for physical layer. According to use system based on client/server model, the RSM system produces optimal system performance.



(그림 2) Client/Server Model at RSMS
(Fig. 2) RSM의 Client/Server 모델

The object of middle-ware layer is connecting between user layer and enterprise which consists of commercial product. From the technical properties the operating methods of providing by middleware are three division of Remote Procedure call(RPC), Message Queuing software and object request brokers.

RPC provides communication messenger among other platform in the network. Advantage/Disadvantage of RPC was specified in the <Table 1>[10].

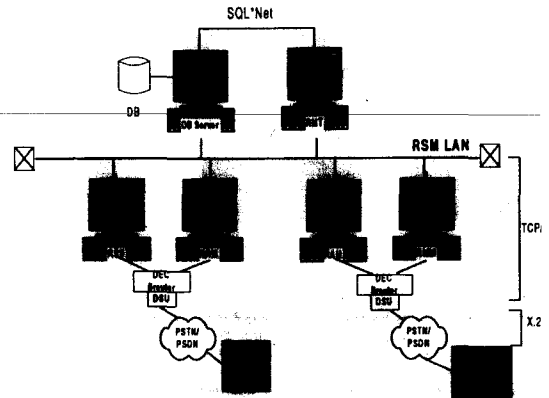
<Table 1> Advantage/Disadvantage of RPC

<표 1 > RPC의 장점/단점

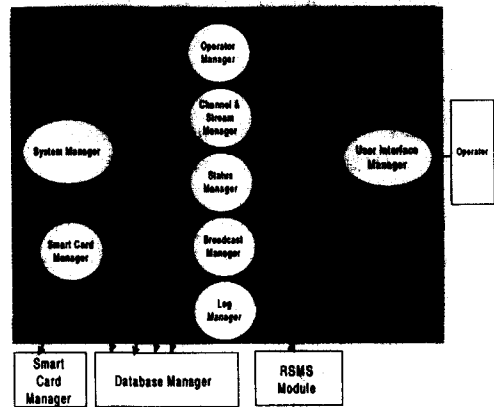
Advantage	Disadvantage
Tightly Coupled	Time delay(waiting for response)
Optimal Performance on the Network with high Bandwidth	Transfer status information is lower
Application is packaged	Resource of network is available anytime

To implement the GUI(Graphic User Interface) in the RSMS Motif 1.2 version and X-designer is used as basic tools which are commercial product software [11]. As a language to implement the each user interface of the RSMS, C language is used. Using the implement environment displayed in the Fig 3. We suppose and implement the RRM(CReal Time RSMS Monitor and Control) software and uses a client-server communication for developing the RRM algorithms. In the client-server model, RRM requests service from other components via local and RPC which communicates the external RRM interface.

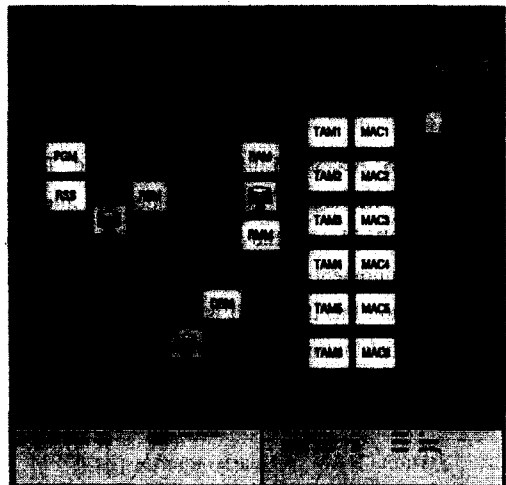
In Fig 4, we displays configuration of RRM software configuration. As display in Fig 4 RRM consists of several modules which are user interface processing module, operator information management module, channel & stream management module, status information management module, system management module and log management module. For instance, operator controls channel information or service stream information using the function by the



(그림 3) RRM 소프트웨어 구현 환경
(Fig 3) Environment for RRM S/W Implementation



(그림 4) RRM 소프트웨어 구성도
(Fig. 4) RRM S/W Configuration



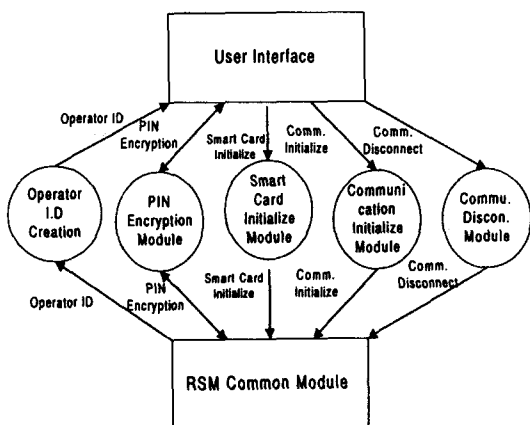
(그림 5) RRM 메인 윈도우
(Fig. 5) RRM Main Window

user interface features.

As a example RRC main window was displayed in (Fig. 5). If operator wants to change the any information system operator changes the information at RMT platform after seeing the this window.

4. RRC Algorithm

The RRC algorithms used to report status procedure and report procedure to RSMS operator in real time. If operator to update resource information or change the program guide information supplied by external program provider the information are processed in real time as displayed in the Fig 6. Also if operator wants to know each status of the platform in the RSMS because the information of status is displayed by a unique color algorithm.



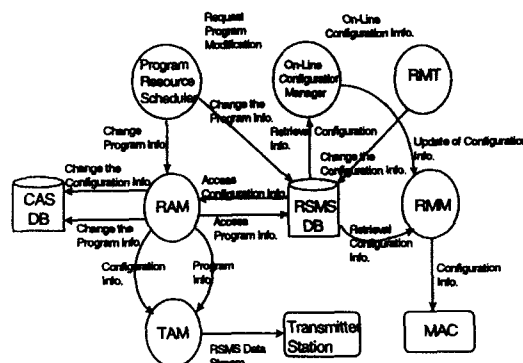
(그림 6) RSM과 스마트 카드 사이의 S/W 절차
(Fig. 6) S/W Procedure between Smart-card and RSM

To communicate between External Manager(RMM, RAM, PGM) and Resource Manager, RPC(Remote Programming Controller) was used.

RMT Manager will be used for client to update the configuration information. Especially data base has been saved the stream information, information changed, deleted and accessed the program guide. The On-line configuration information starts by system operator

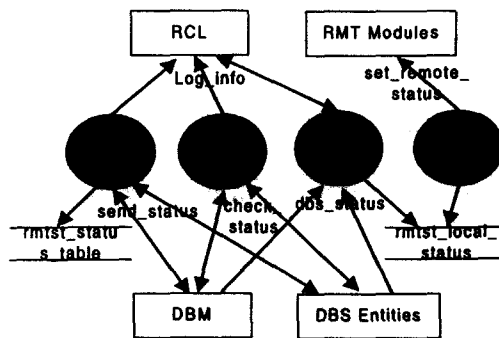
when it changes to service stream information. In that case to prevent loss message the processor should be periodically access and notification the database by RPC.

In the Fig 7 some procedure displays operation scenario using the RPC among the each manager.



(그림 7) RRC 메시지 흐름도
(Fig. 7) RRC Message Flow

In the Fig 8 software procedure was described about external interface with RSMS site.



(그림 8) RRC의 데이터 흐름도
(Fig. 8) Data flow diagram of RRC

5. Conclusion

To implement the RRC several Platforms are purchased and installed in the romm. Also commer-

cial product software purchased from several vendors was installed in each platform. To design and implement of RSMS client/server model was proposed. RSMS has several properties as followings;

First, to provide hardware transportability client/server model was selected and RSMS user interface was designed by window design tools. Therefore add or enhancement of the function is very easy.

Second, As the function of each module was defined clearly maintenance becomes easy.

Third, to design and implement RSMS system an algorithm based on client/server model was proposed.

In the feature we study more about algorithms to improve the system performance especially subscriber usage uploading procedure and subscriber subscription.

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