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(54) DEVICE AND METHOD FOR DISPLAYING BROADCASTING INFORMATION IN DIGITAL BROADCASTING RECEIVER

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Publication Classification

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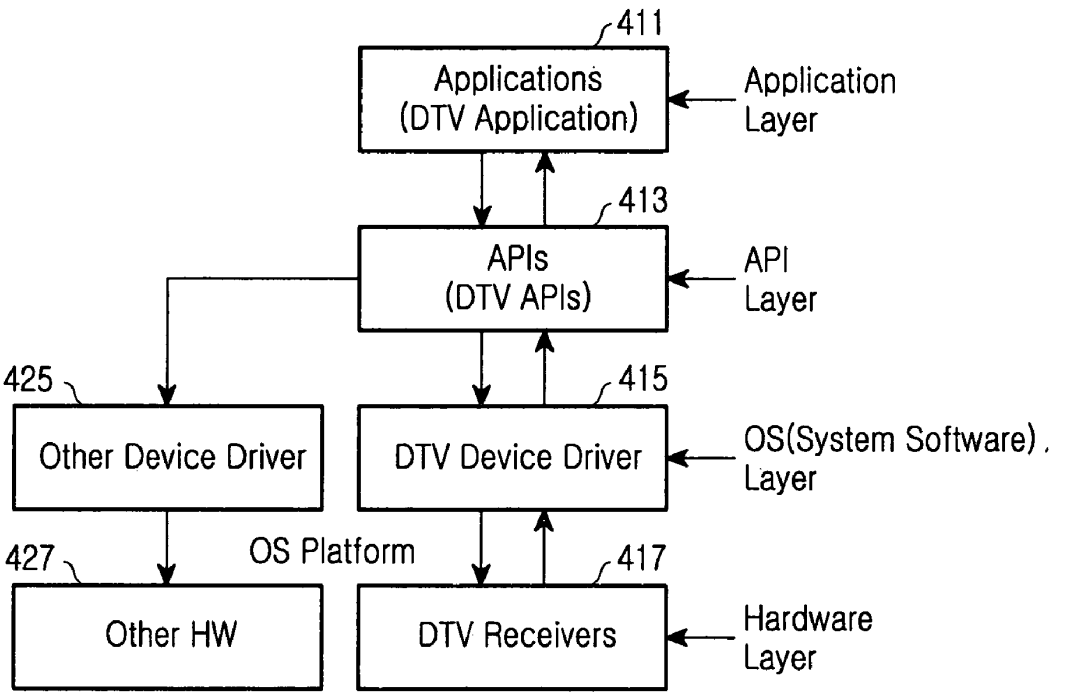
H04N 5/445 (2006.01)

(52) **U.S. Cl.** **725/39**

(57) **ABSTRACT**

Disclosed herein is a device and method for displaying channel information in a digital broadcasting receiver. A broadcasting receiver receives and demodulates a digital broadcasting signal of a selected channel. A data processor demultiplexes the demodulated broadcasting signal, separates Electronic Program Guide (EPG) data and broadcasting data, and decodes the broadcasting data. A controller controls an operation for analyzing the EPG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of service channels, generating structured EPG data, and displaying the EPG data or the structured EPG data in response to a user's selection when a channel information display request is made. A memory stores the EPG data and the structured EPG data under control of the controller. A display unit displays the EPG data or the structured EPG data in channel information.



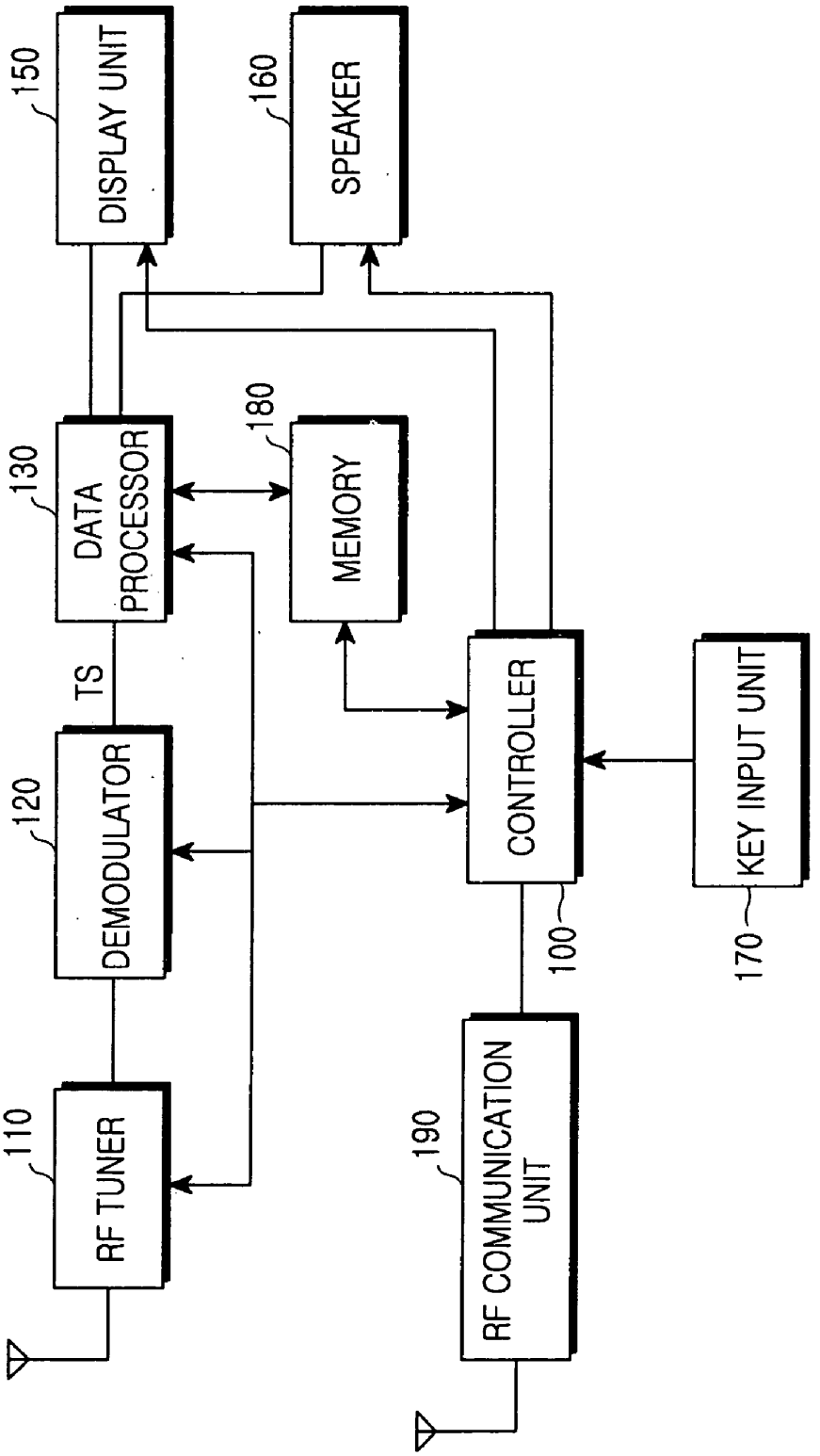

150
DISPLAY UNIT
160
SPEAKER
130
DATA PROCESSOR
180
MEMORY
TS
120
DEMODULATOR
CONTROLLER
KEY INPUT UNIT
110
RF TUNER
100
190
RF COMMUNICATION UNIT
170

FIG. 1

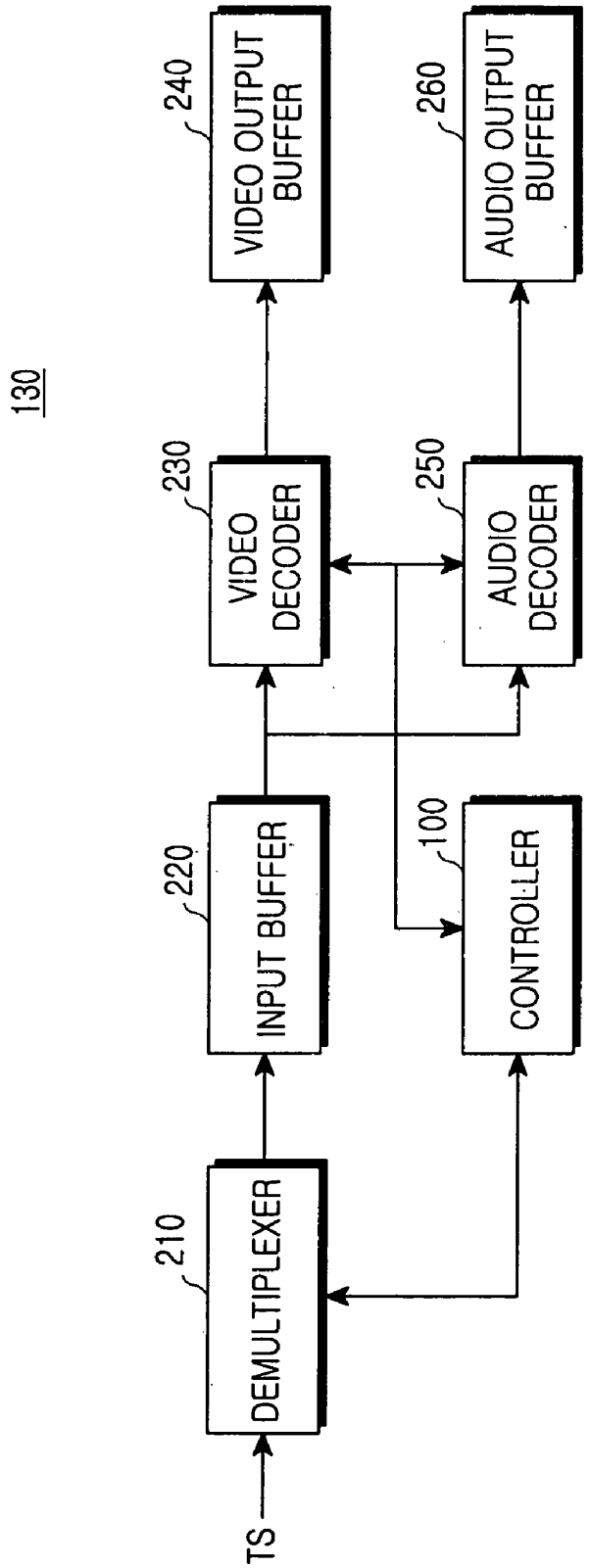

130
TS
210
DEMULTIPLEXER
220
INPUT BUFFER
100
CONTROLLER
230
VIDEO DECODER
250
AUDIO DECODER
240
VIDEO OUTPUT BUFFER
260
AUDIO OUTPUT BUFFER

FIG.2

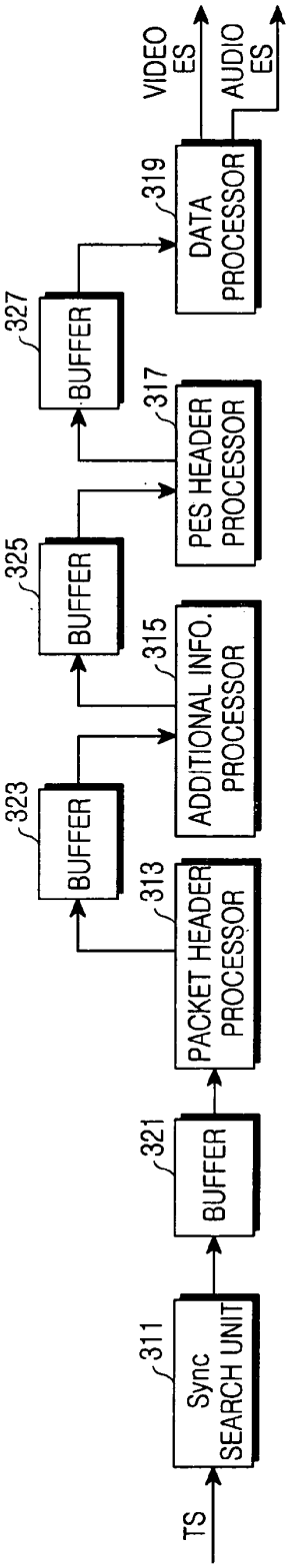

TS
311
Sync SEARCH UNIT
321
BUFFER
313
PACKET HEADER PROCESSOR
323
BUFFER
315
ADDITIONAL INFO. PROCESSOR
325
BUFFER
317
PES HEADER PROCESSOR
327
BUFFER
319
DATA PROCESSOR
VIDEO ES
AUDIO ES

FIG.3

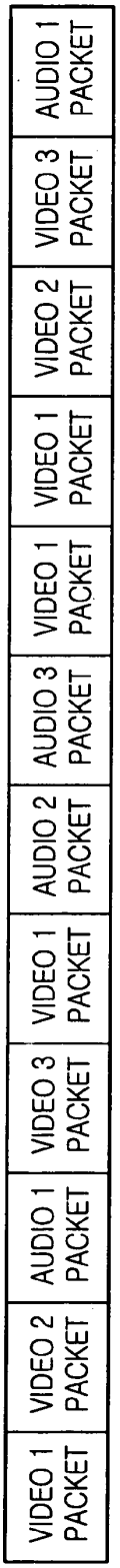


FIG.4A

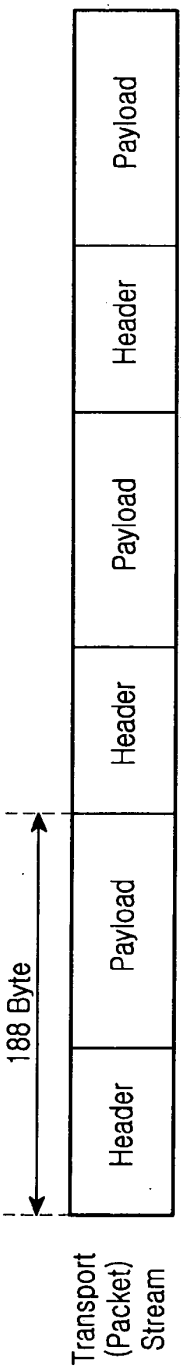


FIG.4B

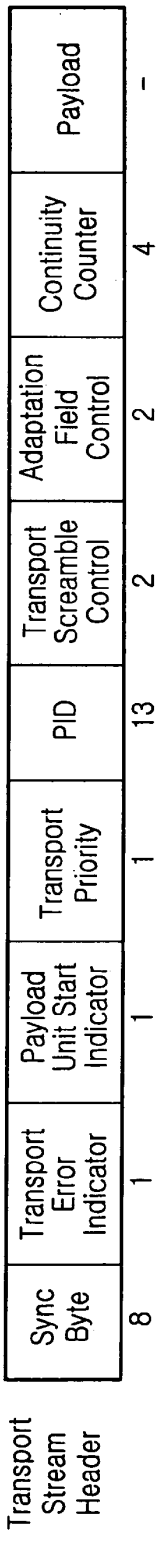


FIG.4C

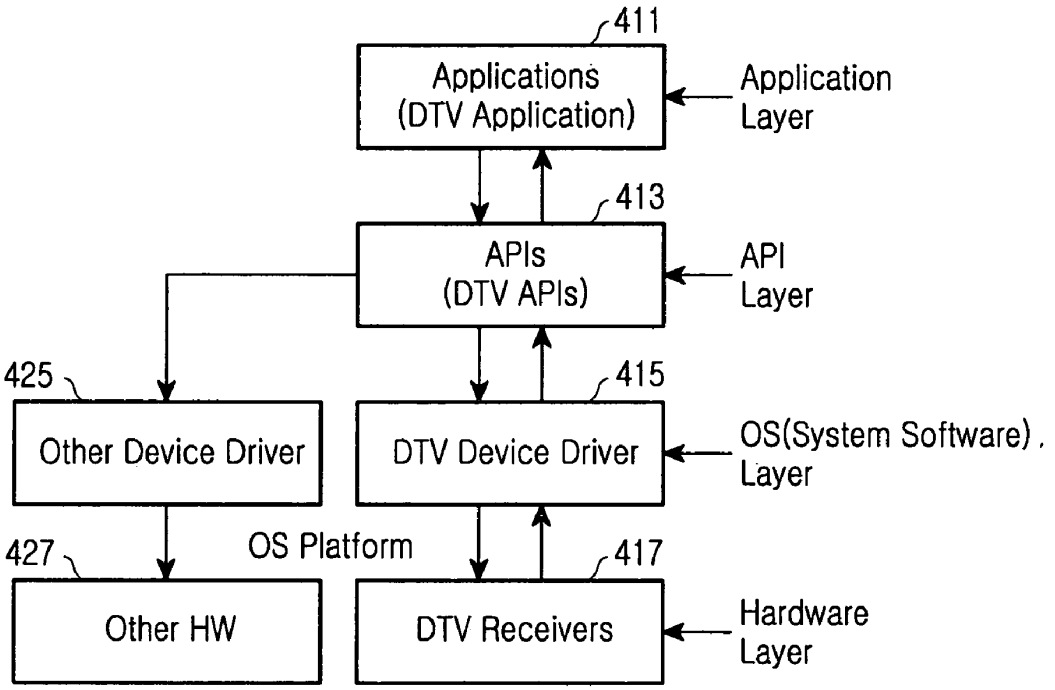

411
Applications
(DTV Application)
Application
Layer
413
APIs
(DTV APIs)
API
Layer
425
415
Other Device Driver
DTV Device Driver
OS(System Software)
Layer
427
OS Platform
417
Other HW
DTV Receivers
Hardware
Layer

FIG.5

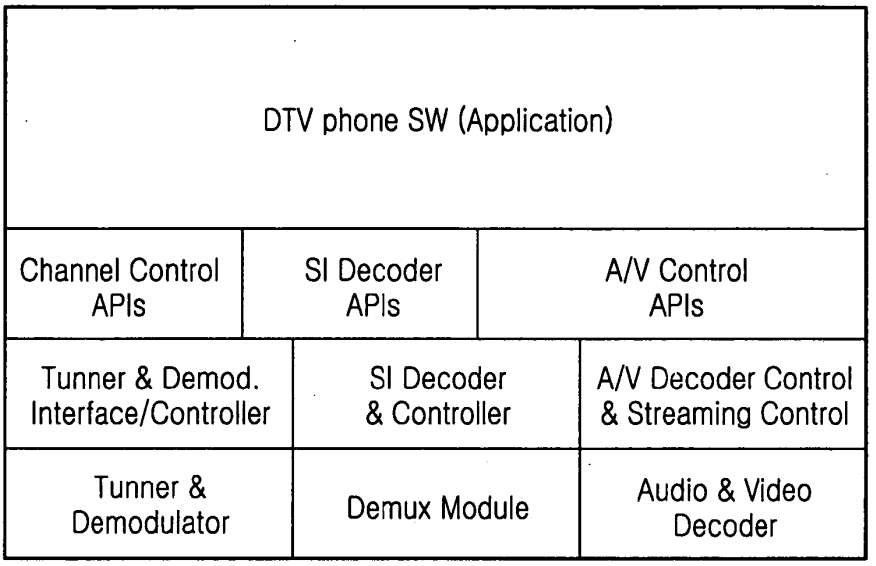

DTV phone SW (Application)
Channel Control APIs
SI Decoder APIs
A/V Control APIs
Tunner & Demod. Interface/Controller
SI Decoder & Controller
A/V Decoder Control & Streaming Control
Tunner & Demodulator
Demux Module
Audio & Video Decoder

FIG.6A

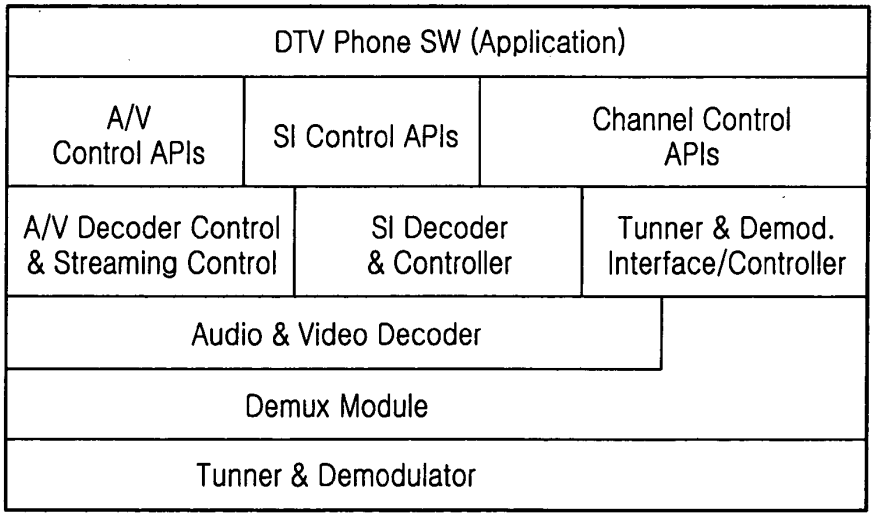

DTV Phone SW (Application)
A/V Control APIs
SI Control APIs
Channel Control APIs
A/V Decoder Control & Streaming Control
SI Decoder & Controller
Tunner & Demod. Interface/Controller
Audio & Video Decoder
Demux Module
Tunner & Demodulator

FIG.6B

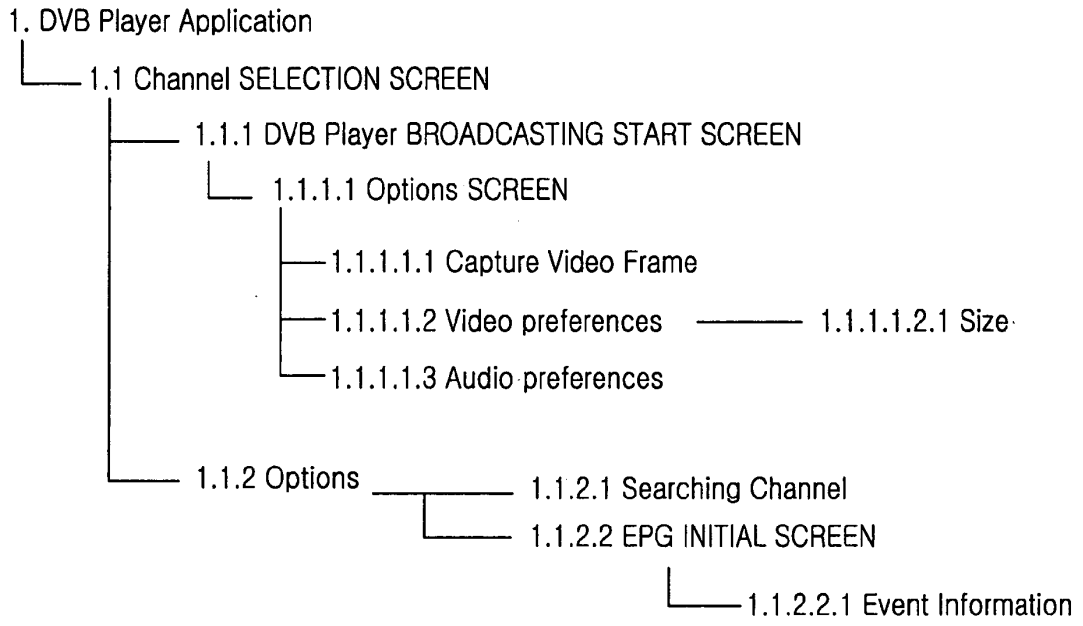

1. DVB Player Application
1.1 Channel SELECTION SCREEN
1.1.1 DVB Player BROADCASTING START SCREEN
1.1.1.1 Options SCREEN
1.1.1.1.1 Capture Video Frame
1.1.1.1.2 Video preferences
1.1.1.1.2.1 Size
1.1.1.1.3 Audio preferences
1.1.2 Options
1.1.2.1 Searching Channel
1.1.2.2 EPG INITIAL SCREEN
1.1.2.2.1 Event Information

FIG.7

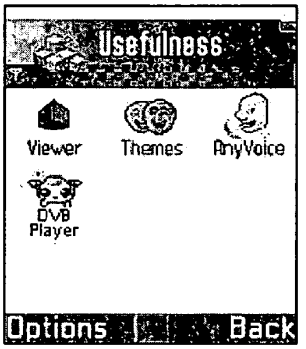
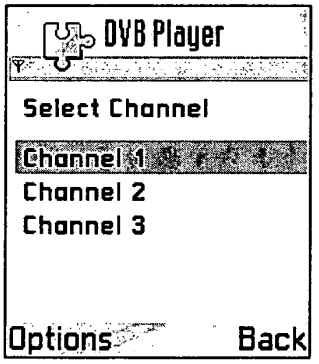
MENU CONTENT	1.1 Channel SELECTION SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	OK(1.1.1), Options(1.1.2), Back(MainMenu)

FIG.8A

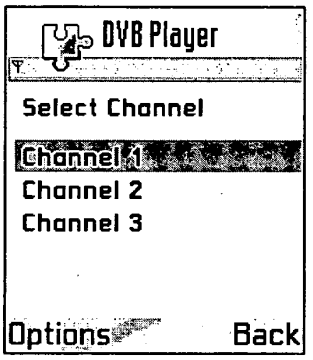
MENU CONTENT	1.1.1 DVB BROADCASTING OUTPUT SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	Options(1.1.1.1), Back(1.1)

FIG.8B

MENU CONTENT	1.1.1.1 DVB BROADCASTING OUTPUT OPTION SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player->Options
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1.1) OK Key 1. Close DVB Player -> 1.1 2. Capture Video Frame -> 1.1.1.1.1 3. Video Preferences ->1.1.1.1.2 4. Audio Preferences ->1.1.1.1.3 5. View EPG Information ->1.1.2.2 6. Change Channel -> 1.1.1

FIG.8C

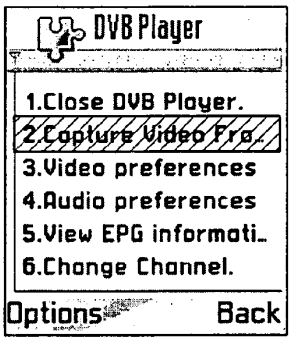
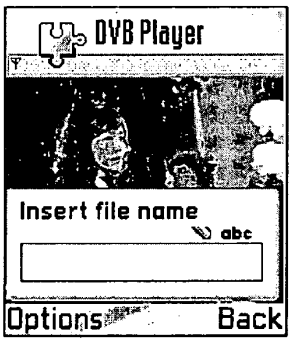
MENU CONTENT	1.1.1.1.1 STORAGE SCREEN OF CAPTURED PICTURE
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options->Capture Video Frame
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	ALPHANUMERIC KEY, DIRECTION KEY (MENU SELECTION), Back(1.1.1) OK Key(1.1.1.);

FIG.8D

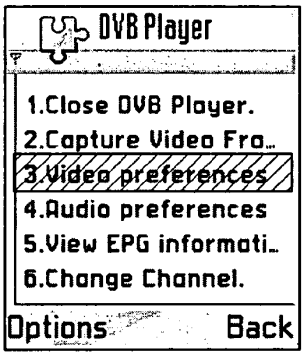
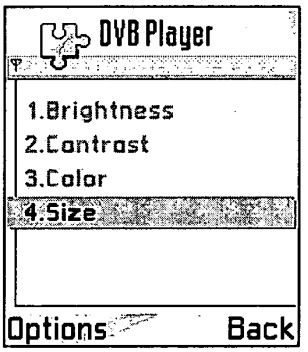
MENU CONTENT	1.1.1.1.2 Video Preferences SETTING SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options-> 3. Video Preferences
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1.1) OK Key 4. Size -> 1.1.1.1.2.1

FIG.8E

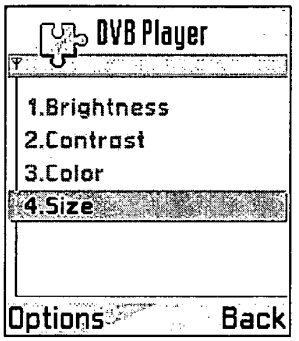
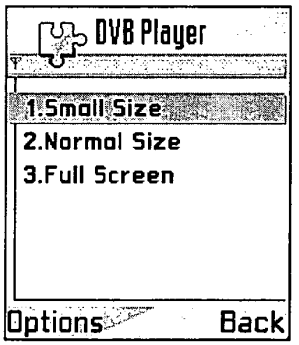
MENU CONTENT	1.1.1.1.2.1 Video SCREEN OF SIZE SELECTION IN VIDEO SETTING
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options->3. Video Preferences -> Size
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1.1) OK Key (1.1.1)

FIG.8F

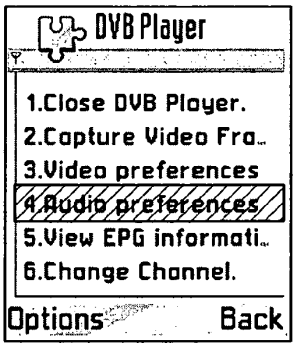
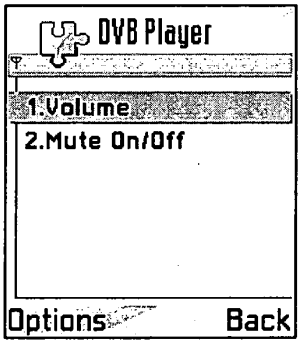
MENU CONTENT	1.1.1.1.3 Audio Preferences SETTING SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options->4. Audio Preferences
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1.1) OK Key (1.1.1)

FIG.8G

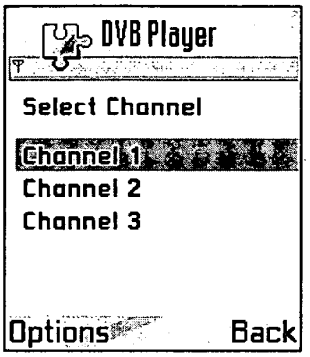
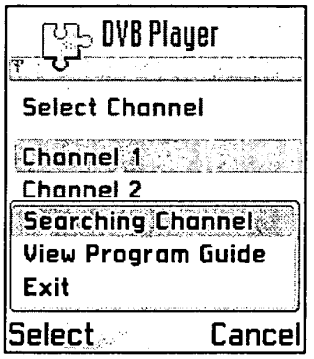
MENU CONTENT	1.1.2 Channel OPTION SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel-> Options
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1) OK Key Searching Channel (1.1.2.1) View Program Guide(1.1.2.2)

FIG.8H

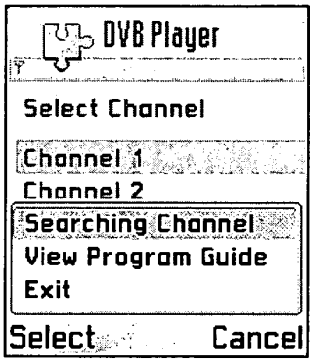
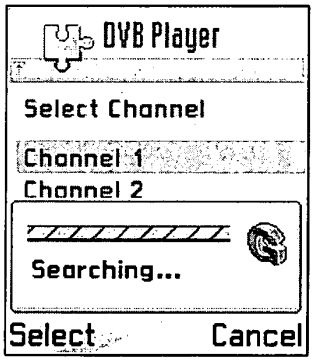
MENU CONTENT	1.1.2.1 Channel Searching SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel-> Options-> Searching Channel
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	Any Key (1.1)

FIG.8I

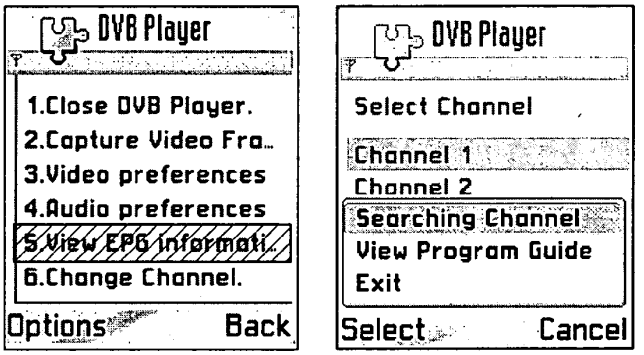
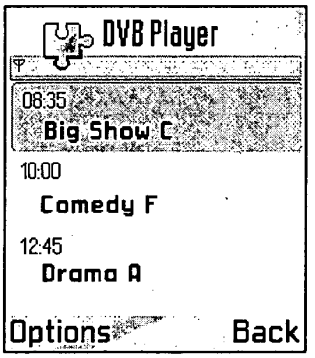
MENU CONTENT	1.1.2.2 EPG INITIAL SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options->5. View EPG Information MainMenu->DVB Player->Select Channel->Options-> 2. View Program Guide
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1) OK Key (1.1.1)

FIG.8J

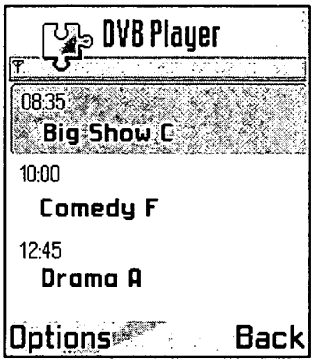
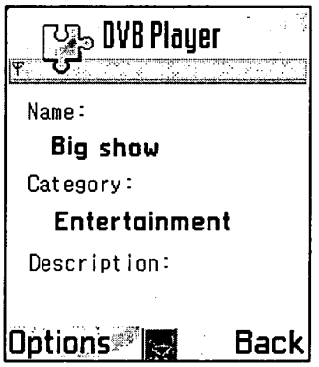
MENU CONTENT	1.1.2.2.1 EPG Event DETAILED INFO. SCREEN
MENU EXECUTION METHOD	MainMenu->DVB Player->Select Channel->DVB Player-> Options->View Program Guide->Event
MENU ACCESS SCREEN	
MENU EXECUTION RESULT	
TERMINAL KEY MANIPULATION	DIRECTION KEY (MENU SELECTION) , Back(1.1.2.2)

FIG.8K

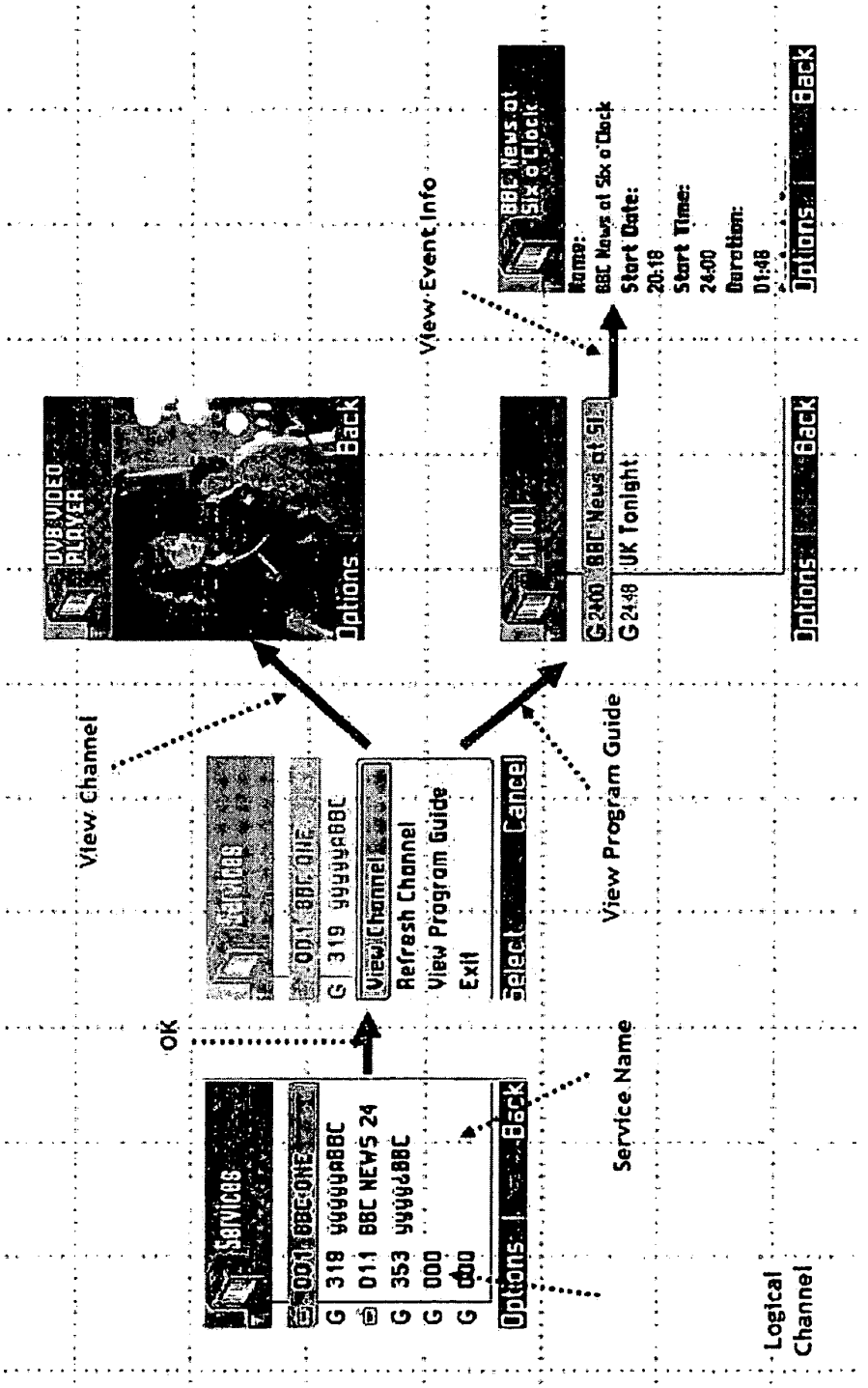

Services
001 BBC ONE
318 BBC
011 BBC NEWS 24
353 BBC
000
000
Options
Back
Service Name
Logical Channel
Ok
001 BBC ONE
319 BBC
View Channel
Refresh Channel
View Program Guide
Exit
Select
Cancel
View Program Guide
DVB VIDEO PLAYER
Options
Back
Ch 00
2400 BBC News at Six
2448 UK Tonight
View Event Info
BBC News at Six o'Clock
Name:
BBC News at Six o'Clock
Start Date:
20-18
Start Time:
24:00
Duration:
01:48
Options
Back

FIG.8L

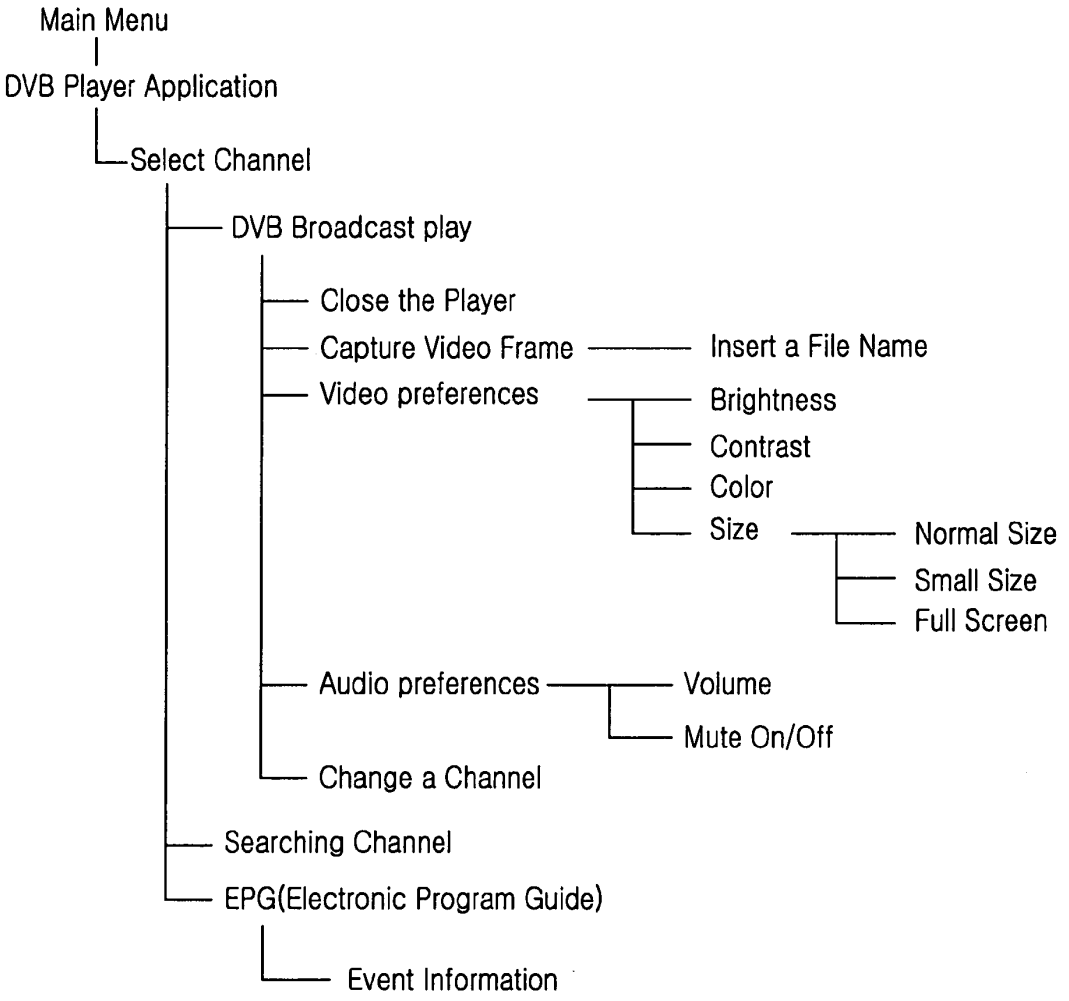

Main Menu
DVB Player Application
Select Channel
DVB Broadcast play
Close the Player
Capture Video Frame
Insert a File Name
Video preferences
Brightness
Contrast
Color
Size
Normal Size
Small Size
Full Screen
Audio preferences
Volume
Mute On/Off
Change a Channel
Searching Channel
EPG(Electronic Program Guide)
Event Information

FIG.9

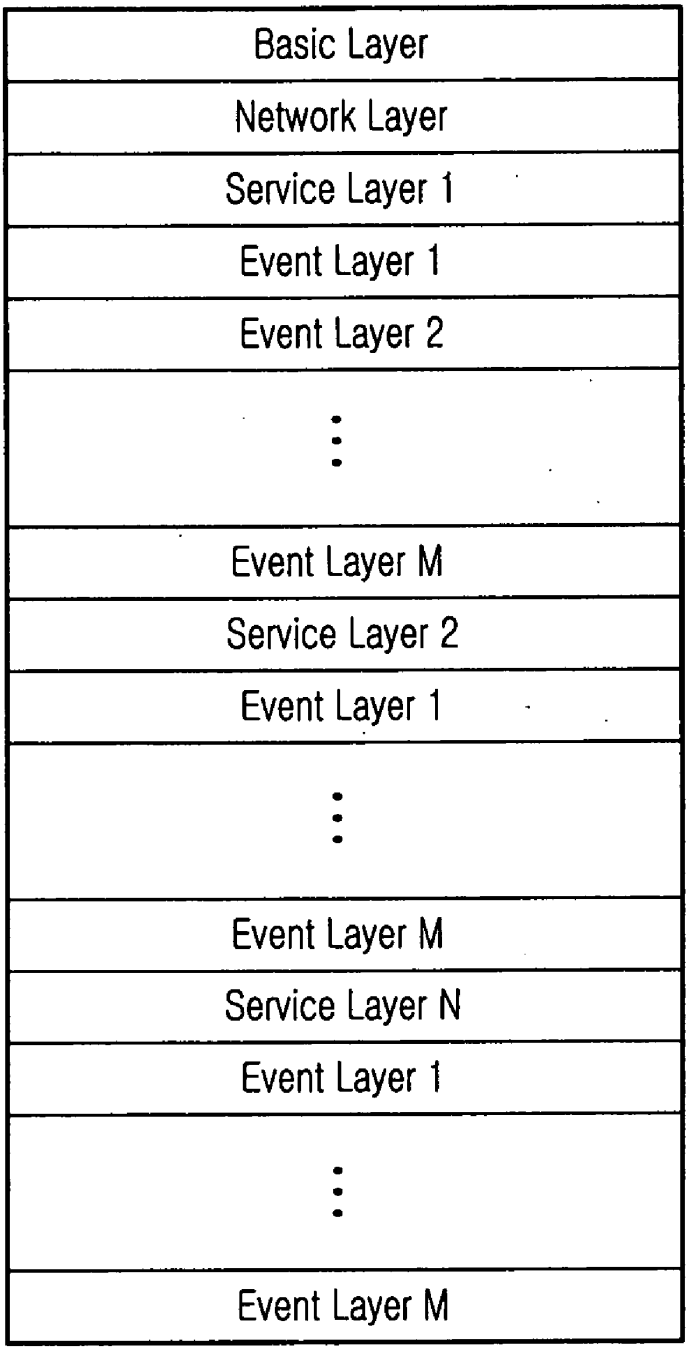

Basic Layer
Network Layer
Service Layer 1
Event Layer 1
Event Layer 2
Event Layer M
Service Layer 2
Event Layer 1
Event Layer M
Service Layer N
Event Layer 1
Event Layer M

FIG.10

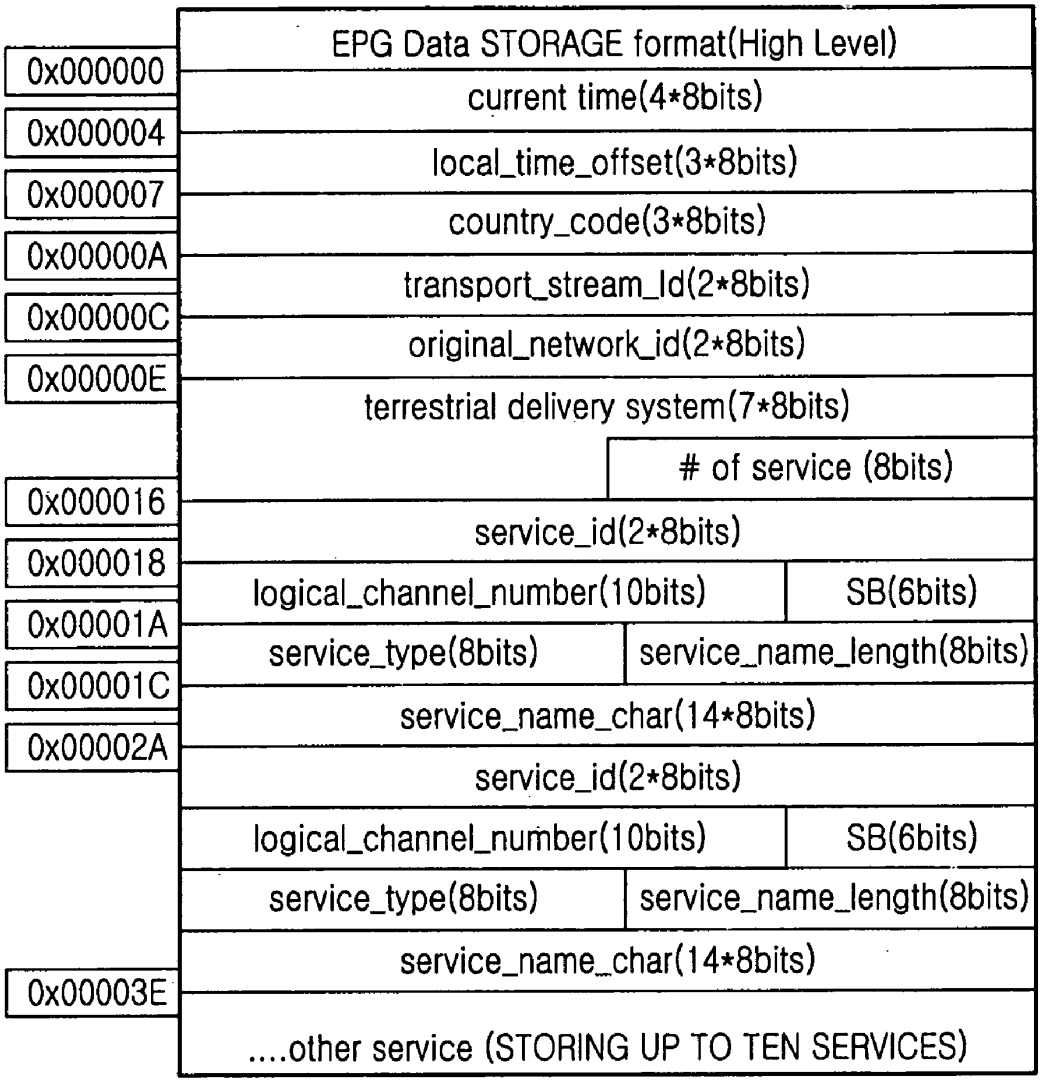

EPG Data STORAGE format(High Level)
0x000000
current time(4*8bits)
0x000004
local_time_offset(3*8bits)
0x000007
country_code(3*8bits)
0x00000A
transport_stream_Id(2*8bits)
0x00000C
original_network_id(2*8bits)
0x00000E
terrestrial delivery system(7*8bits)
# of service (8bits)
0x000016
service_id(2*8bits)
0x000018
logical_channel_number(10bits)
SB(6bits)
0x00001A
service_type(8bits)
service_name_length(8bits)
0x00001C
service_name_char(14*8bits)
0x00002A
service_id(2*8bits)
logical_channel_number(10bits)
SB(6bits)
service_type(8bits)
service_name_length(8bits)
service_name_char(14*8bits)
0x00003E
....other service (STORING UP TO TEN SERVICES)

FIG.11A

EPG Data STORAGE format	
event_id(2*8bits)	
start_time(4*8bits)	
duration(2*8bits)	
event_name_length(8bits)	
event_name_char(60*8bits)	
content_level(8bits)	rating(8bits)
text_char_length(8bits)	
text_char(255*8bits)	
event_id(2*8bits)	
start_time(4*8bits)	
duration(2*8bits)	
event_name_length(8bits)	
event_name_char(60*8bits)	
content_level(8bits)	rating(8bits)
text_char_length(8bits)	
text_char(255*8bits)	
....other event (STORING UP TO TEN EVENTS)	

FIG.11B

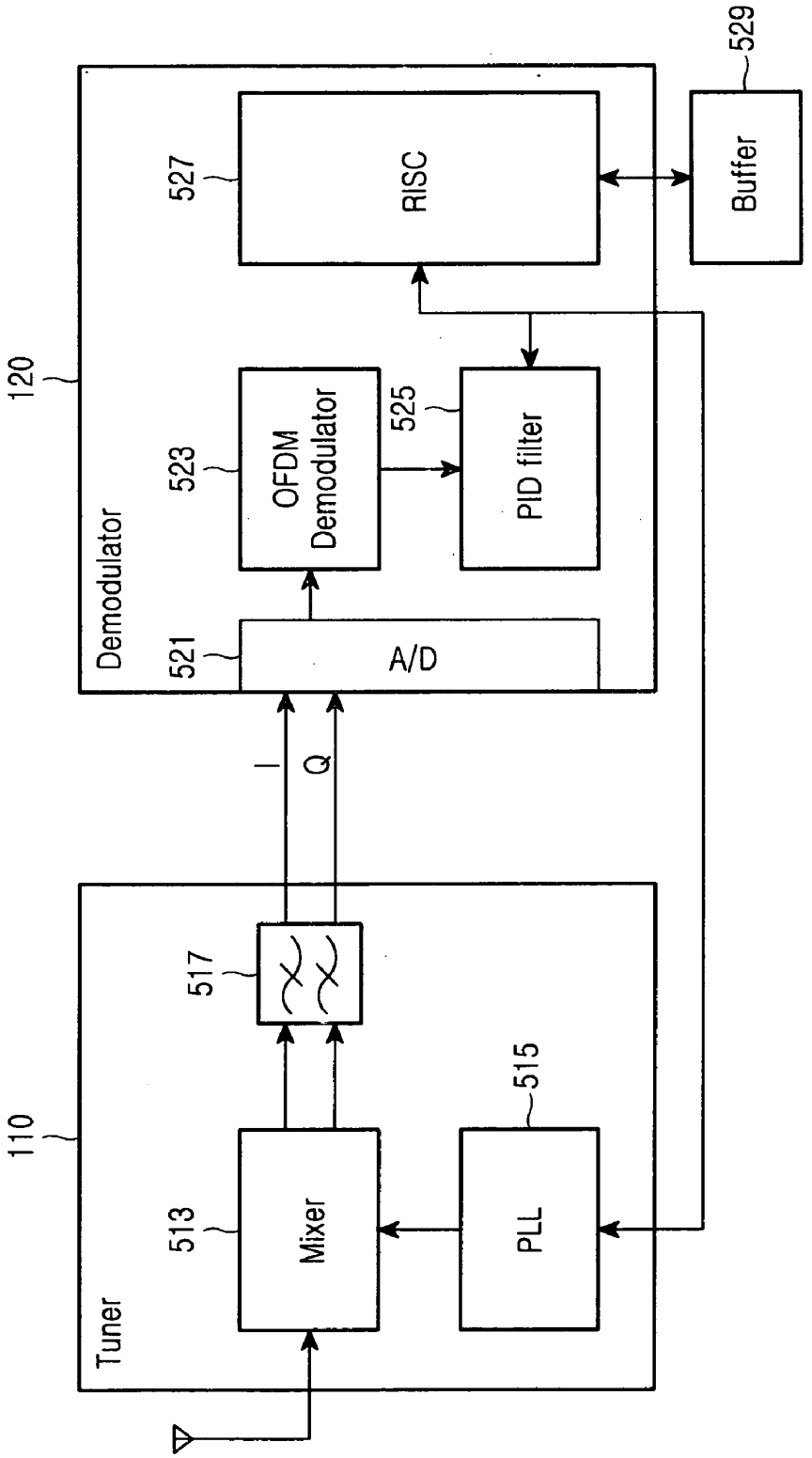

529
Buffer
527
RISC
120
Demodulator
523
OFDM Demodulator
525
PID filter
521
A/D
I
Q
517
110
Tuner
513
Mixer
515
PLL

FIG. 12

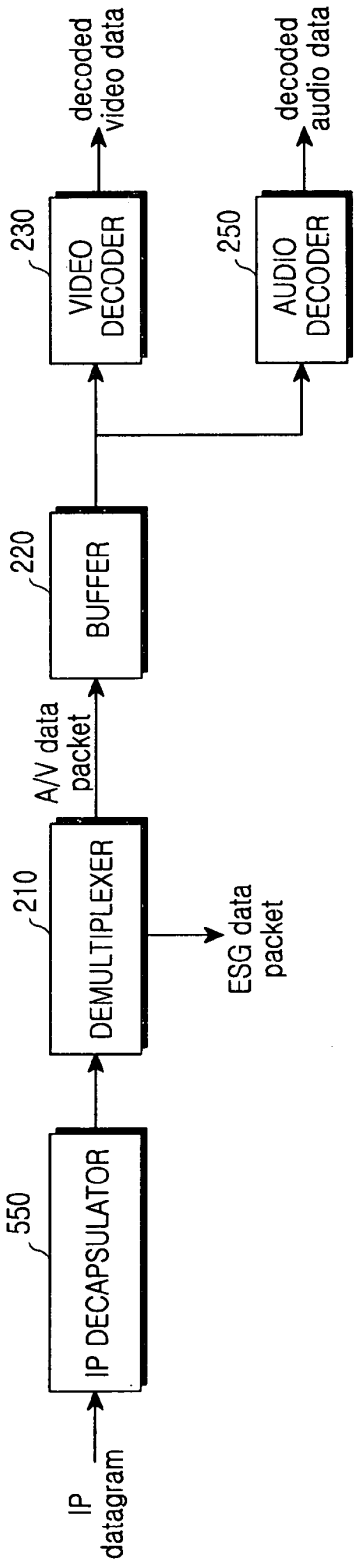

IP datagram
550
IP DECAPSULATOR
210
DEMULTIPLEXER
ESG data packet
A/V data packet
220
BUFFER
230
VIDEO DECODER
250
AUDIO DECODER
decoded video data
decoded audio data

FIG.13

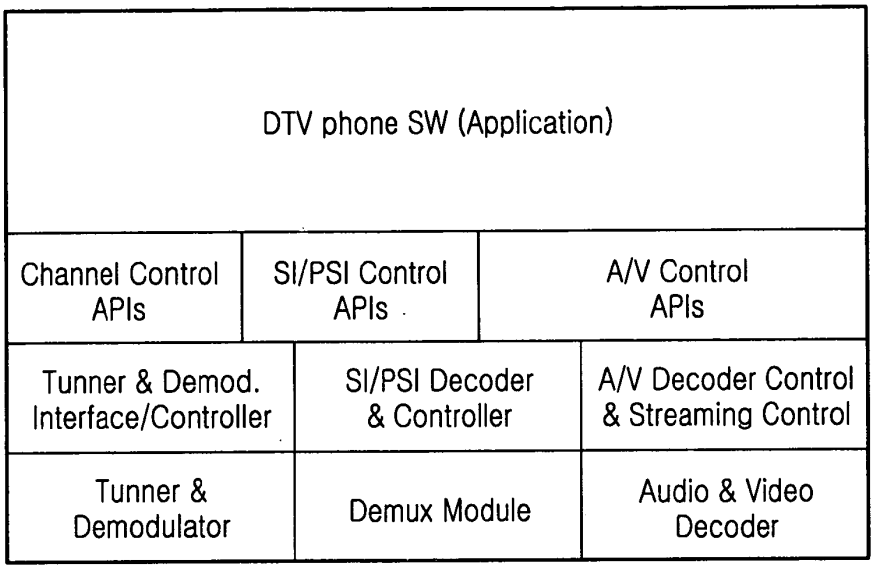


FIG.14A

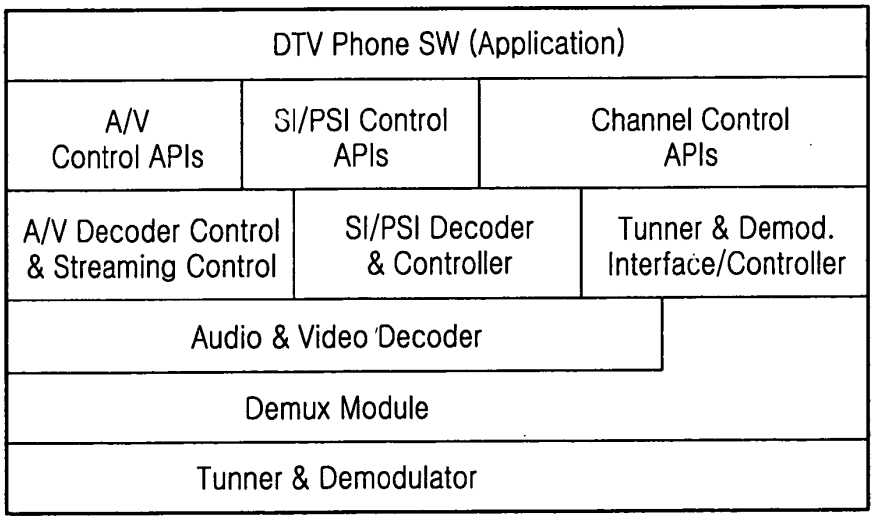


FIG.14B

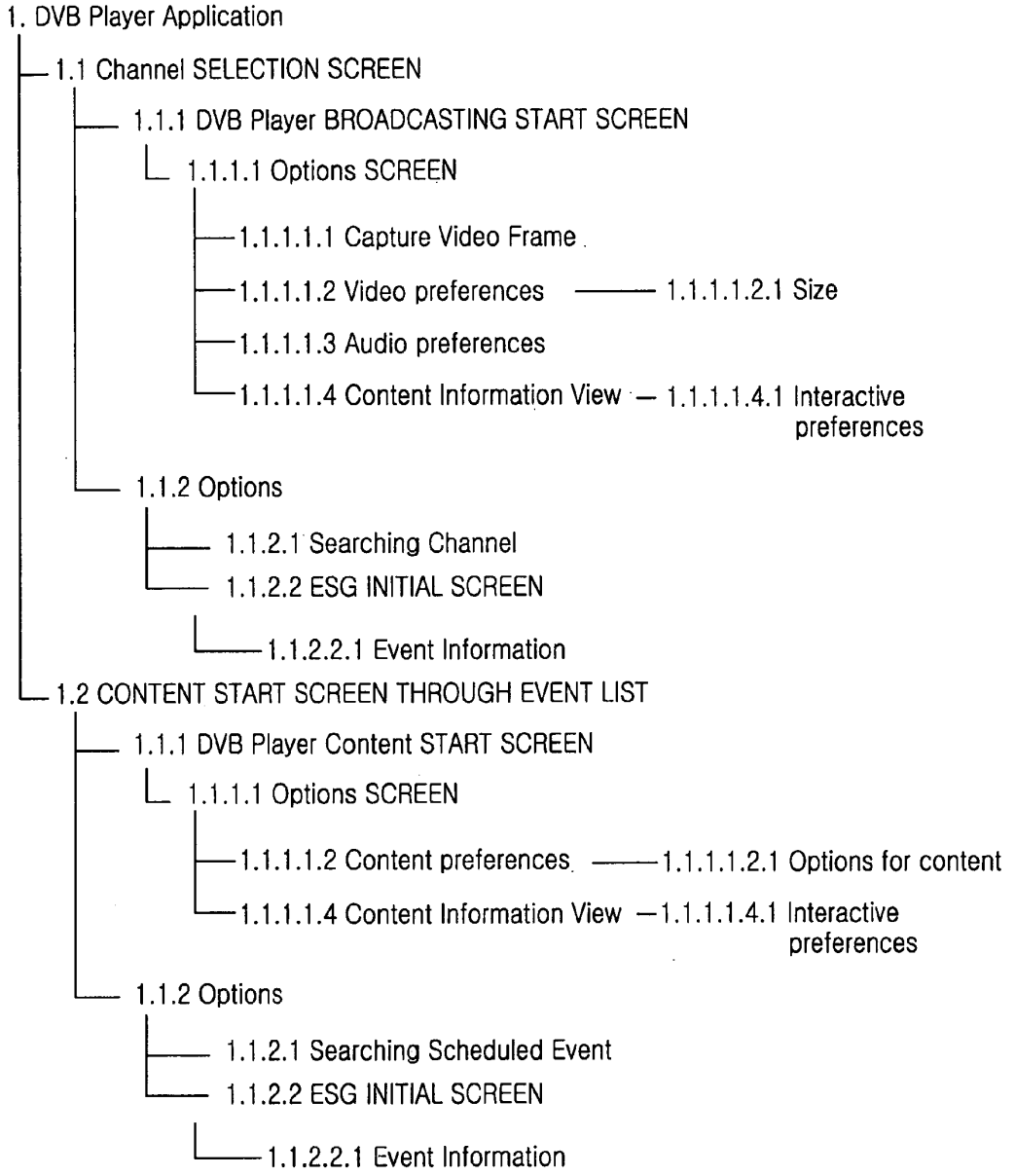

1. DVB Player Application
1.1 Channel SELECTION SCREEN
1.1.1 DVB Player BROADCASTING START SCREEN
1.1.1.1 Options SCREEN
1.1.1.1.1 Capture Video Frame
1.1.1.1.2 Video preferences
1.1.1.1.2.1 Size
1.1.1.1.3 Audio preferences
1.1.1.1.4 Content Information View
1.1.1.1.4.1 Interactive preferences
1.1.2 Options
1.1.2.1 Searching Channel
1.1.2.2 ESG INITIAL SCREEN
1.1.2.2.1 Event Information
1.2 CONTENT START SCREEN THROUGH EVENT LIST
1.1.1 DVB Player Content START SCREEN
1.1.1.1 Options SCREEN
1.1.1.1.2 Content preferences
1.1.1.1.2.1 Options for content
1.1.1.1.4 Content Information View
1.1.1.1.4.1 Interactive preferences
1.1.2 Options
1.1.2.1 Searching Scheduled Event
1.1.2.2 ESG INITIAL SCREEN
1.1.2.2.1 Event Information

FIG.15

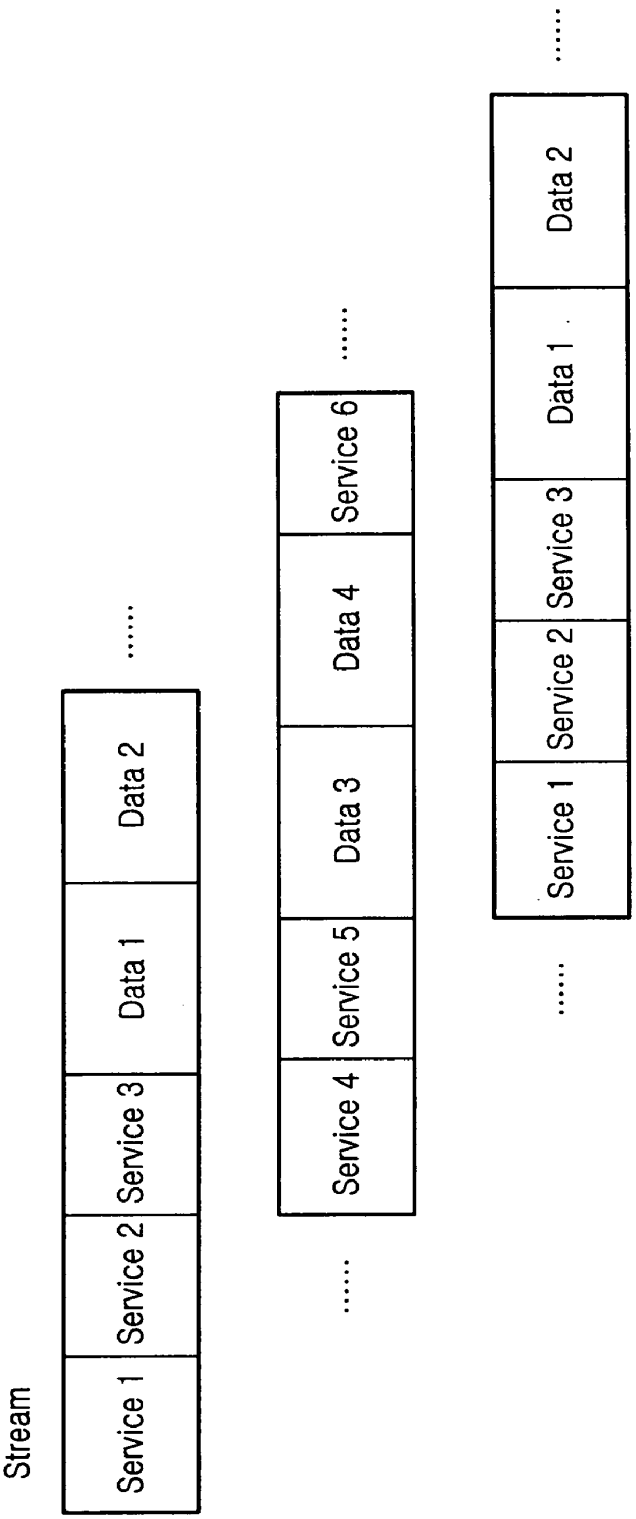

Stream
Service 1
Service 2
Service 3
Data 1
Data 2
.....
.....
Service 4
Service 5
Data 3
Data 4
Service 6
.....
.....
Service 1
Service 2
Service 3
Data 1
Data 2
.....

FIG.16A

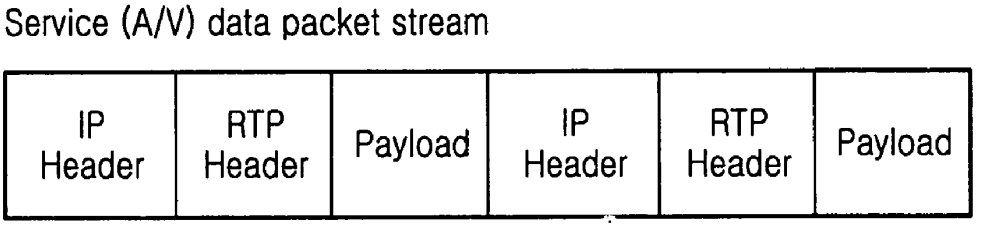


FIG.16B

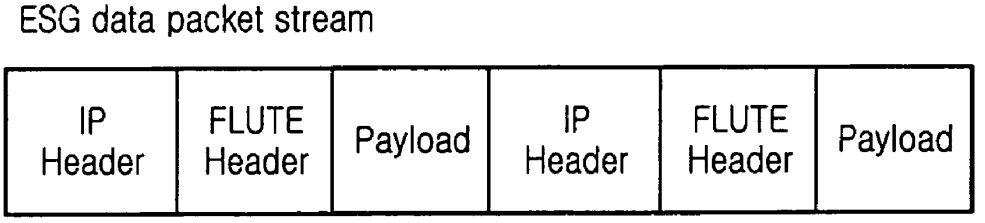


FIG.16C

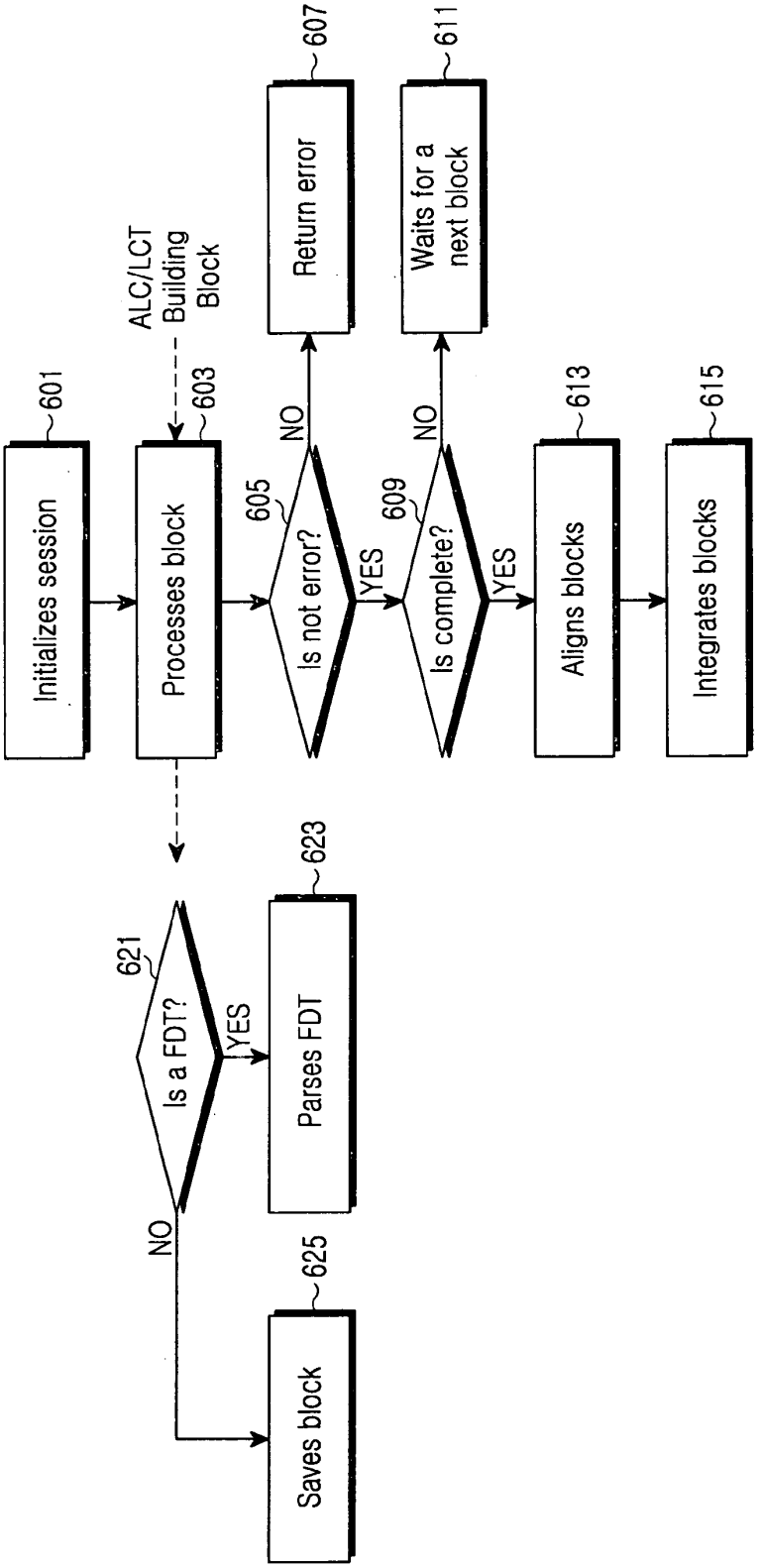

601
Initializes session
603
Processes block
ALC/LCT Building Block
605
Is not error?
NO
607
Return error
YES
609
Is complete?
NO
611
Waits for a next block
YES
613
Aligns blocks
615
Integrates blocks
621
Is a FDT?
YES
623
Parses FDT
NO
625
Saves block

FIG. 17

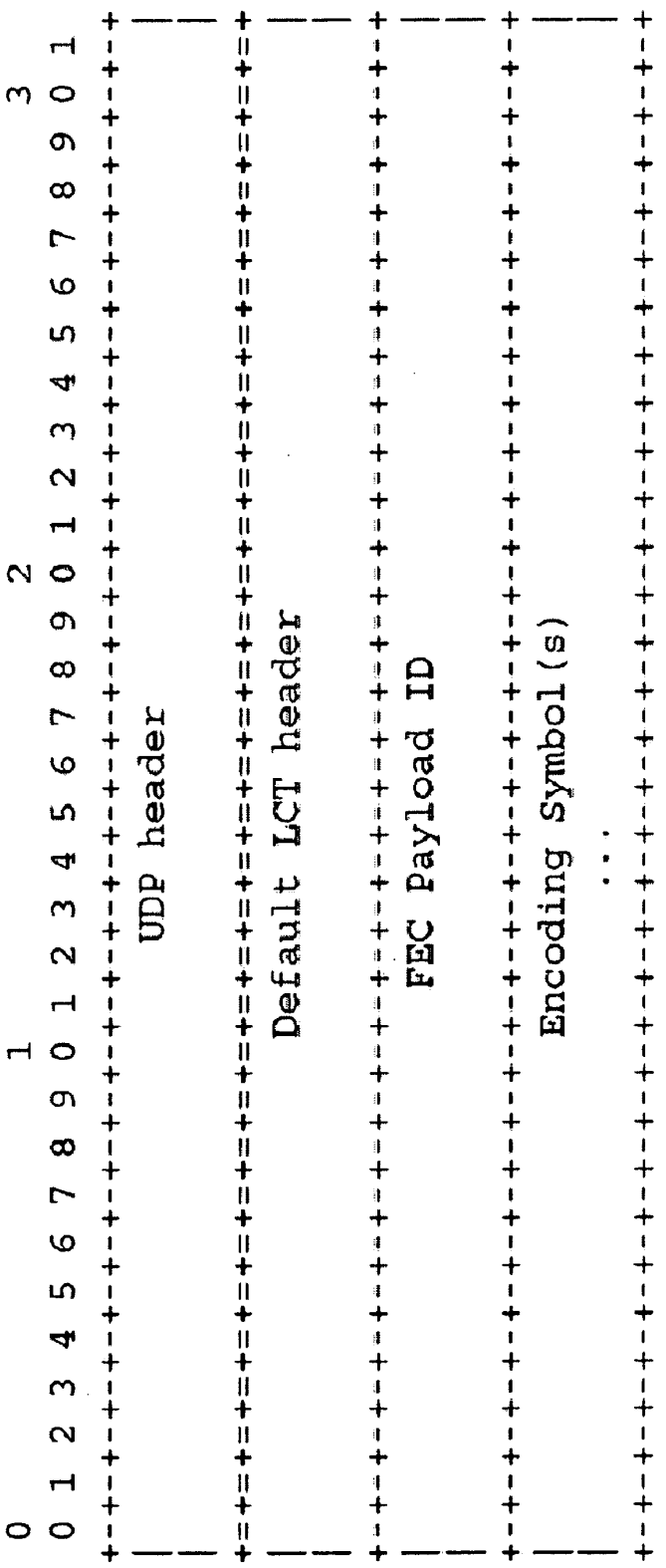

0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
UDP header
Default LCT header
FEC Payload ID
Encoding Symbol(s)
...

FIG.18A

0 1 2 3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
V | C | r |S| O |H|T|R|A|B| HDR_LEN | Codepoint (CP)
Congestion Control Information (CCI, length = 32*(C+1) bits)
...
Transport Session Identifier (TSI, length = 32*S+16*H bits)
...
Transport Object Identifier (TOI, length = 32*O+16*H bits)
...
Sender Current Time (SCT, if T = 1)
Expected Residual Time (ERT, if R = 1)
Header Extensions (if applicable)
...

FIG.18B

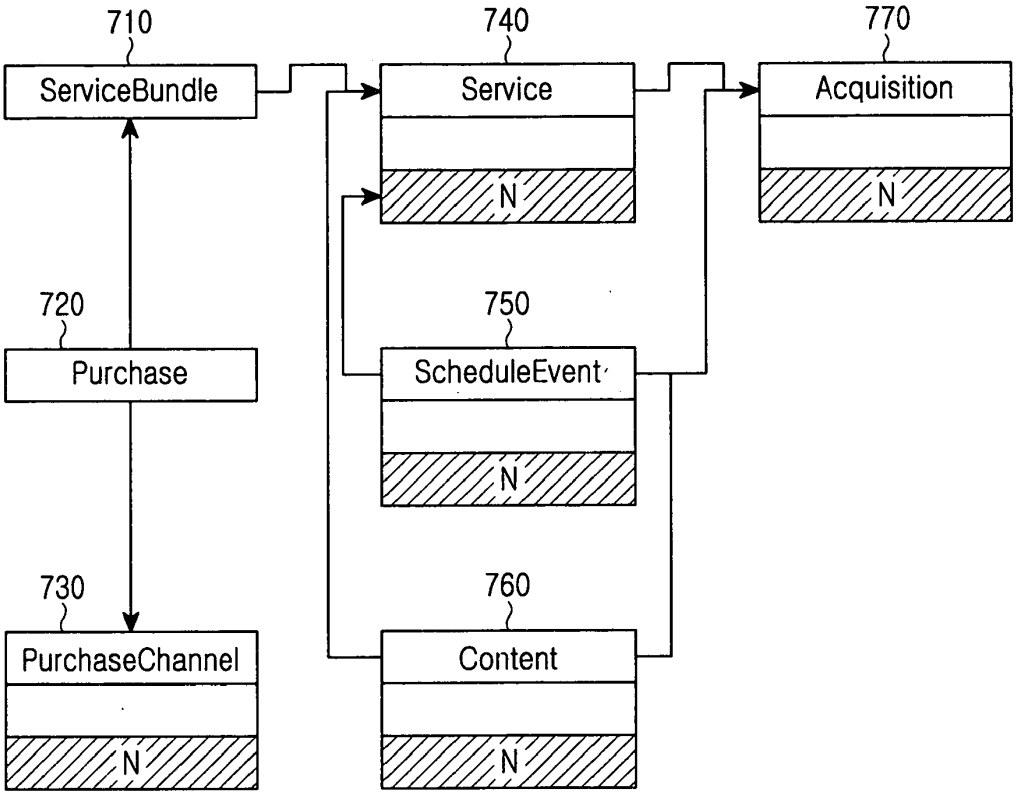

710
ServiceBundle
740
Service
N
770
Acquisition
N
720
Purchase
750
ScheduleEvent
N
730
PurchaseChannel
N
760
Content
N

FIG.19

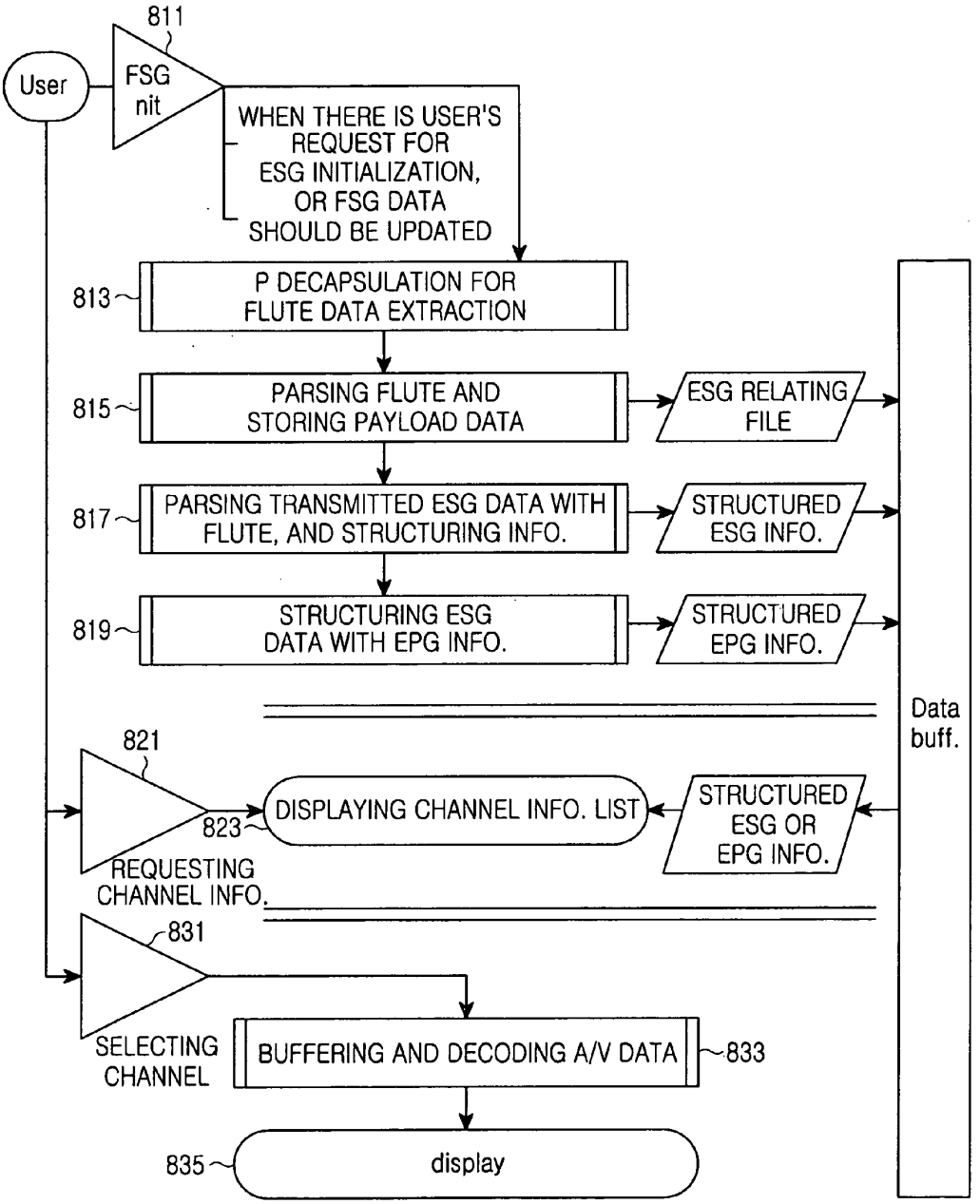

811
User
FSG nit
WHEN THERE IS USER'S REQUEST FOR ESG INITIALIZATION, OR FSG DATA SHOULD BE UPDATED
813
P DECAPSULATION FOR FLUTE DATA EXTRACTION
815
PARSING FLUTE AND STORING PAYLOAD DATA
ESG RELATING FILE
817
PARSING TRANSMITTED ESG DATA WITH FLUTE, AND STRUCTURING INFO.
STRUCTURED ESG INFO.
819
STRUCTURING ESG DATA WITH EPG INFO.
STRUCTURED EPG INFO.
Data buff.
821
823
DISPLAYING CHANNEL INFO. LIST
STRUCTURED ESG OR EPG INFO.
REQUESTING CHANNEL INFO.
831
SELECTING CHANNEL
BUFFERING AND DECODING A/V DATA
833
835
display

FIG.20

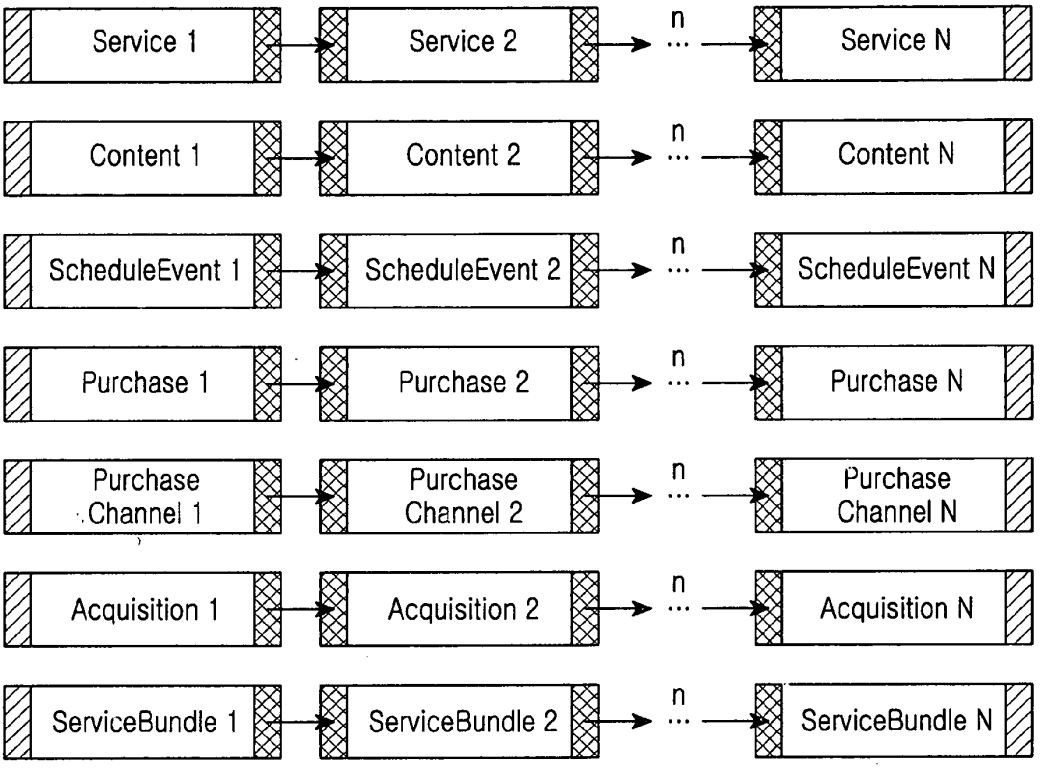

Service 1
Service 2
n
Service N
Content 1
Content 2
n
Content N
ScheduleEvent 1
ScheduleEvent 2
n
ScheduleEvent N
Purchase 1
Purchase 2
n
Purchase N
Purchase Channel 1
Purchase Channel 2
n
Purchase Channel N
Acquisition 1
Acquisition 2
n
Acquisition N
ServiceBundle 1
ServiceBundle 2
n
ServiceBundle N

FIG.21

EPG / ESG data LINK FORMAT	
Service Layer	
EPG	ESG
current time (4*8bits)	
local_time_offset(3*8bits)	
country_code	Language field ⑫
transport_strem_Id	SDP field ⑬
original_network_Id	SDP field ⑬
terrestrial delivery system	SDP field ⑬
service_id	ServiceID field ⑨
logical_channel_number	ServiceID field ⑨
service_type	Genre field
service_name_char	ServiceName field
..... other service	
Event Layer	
event_id	Content ID field ① (⑦)
start_time	Public Start Time field ⑧
duration	Duration field ⑤
event_name_length	length of Title field ②
event_name_char	Title field ②
content_level	Genre field ④
rating	ParentalGuidance field ⑥
text_char_length	length of Synopsis field ③
text_char	Synopsis filed ③
..... other event	

FIG.22

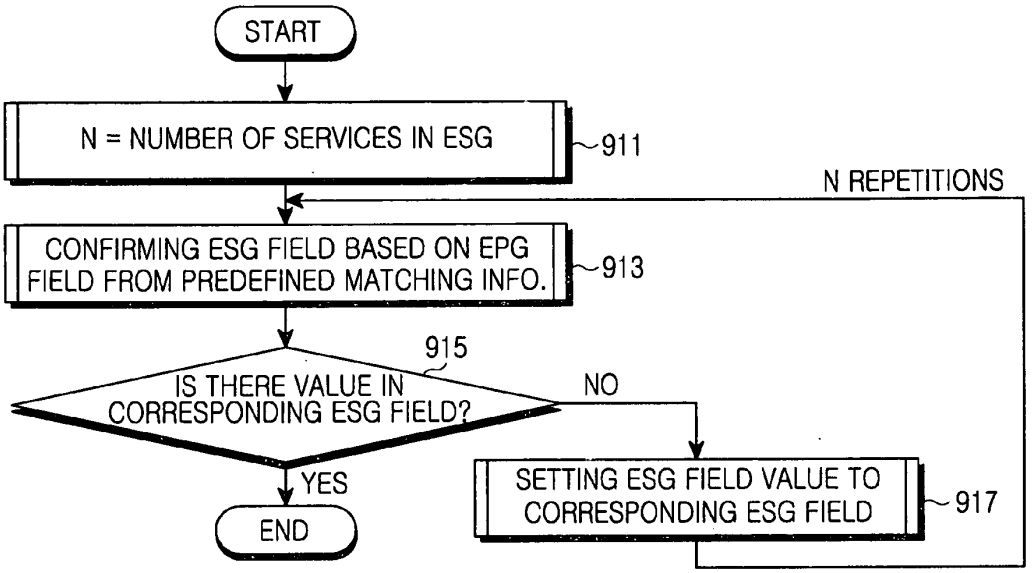

START
N = NUMBER OF SERVICES IN ESG
911
N REPETITIONS
CONFIRMING ESG FIELD BASED ON EPG FIELD FROM PREDEFINED MATCHING INFO.
913
915
IS THERE VALUE IN CORRESPONDING ESG FIELD?
NO
YES
END
SETTING ESG FIELD VALUE TO CORRESPONDING ESG FIELD
917

FIG.23

DEVICE AND METHOD FOR DISPLAYING BROADCASTING INFORMATION IN DIGITAL BROADCASTING RECEIVER

PRIORITY

[0001] This application claims priority to an application entitled "Device and Method For Displaying Broadcasting Information in A Digital Broadcasting Receiving", filed in the Korean Intellectual Property Office on Dec. 14, 2004 and Dec. 13, 2005 and assigned Serial Nos. 105878/2004 and 122483/2005, respectively, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a displaying device and method of a digital broadcasting receiver, and, more particularly, to an apparatus and method for displaying broadcasting information.

[0004] 2. Description of the Related Art

[0005] In general, in wireless terminals there is a trend where a multimedia-dedicated processor is installed or a multimedia function is reinforced. Technology for employing a television function in the wireless terminal is currently being announced, and sales of wireless teals continue even while installation of a digital broadcasting receiver is being researched. Accordingly, current wireless terminals should be constructed to provide various multimedia functions, which complicates the construction and a process of the wireless terminal.

[0006] The digital broadcasting receiver provides many broadcasting channel signals, and also should provide a service for summarizing and displaying programs of respective broadcasting channels. Therefore, a user viewing digital broadcasting should be able to select the broadcasting channels, and easily confirm the programs of the selected broadcasting channel. For this, the digital broadcasting receiver needs a User Interface ("UI") for selecting the broadcasting channel and displaying broadcasting information of the selected broadcasting channel. Even the wireless terminal with a function of receiving the digital broadcasting should be able to display on the UI information received by the digital broadcasting receiver. However, a display unit of the wireless terminal has a relatively small size and also has a lower resolution than that of the general digital broadcasting receiver. Accordingly, it is difficult for the wireless terminal having a function of the digital broadcasting receiver to display broadcasting program information as done on the general digital broadcasting receiver.

SUMMARY OF THE INVENTION

[0007] It is, therefore, an object of the present invention to provide a method and apparatus for displaying digital broadcasting information in a wireless terminal having a digital broadcasting receiver.

[0008] It is another object of the present invention to provide a method for constructing an Electronic Program Guide (EPG) table displaying broadcasting program information in a digital broadcasting receiver.

[0009] It is a further object of the present invention to provide a method for displaying broadcasting program information of a service channel selected by a user, using an EPG table storing information of physical and service channels and program information of the respective service channels, in a wireless terminal having a digital broadcasting receiver.

[0010] It is a further another object of the present invention to provide an apparatus and method for, upon display of channel information, displaying summary information including names of broadcasting channels provided, and upon selection of the displayed service channel, displaying summary information of program of the selected service channel in a digital broadcasting receiver.

[0011] It is yet another object of the present invention to provide an apparatus and method for generating EPG data, and structured EPG data obtained by structuring service channel information of the EPG data and program information of respective service channels, and upon display of the channel information, selectively displaying the EPG data or the structured EPG data depending on user selection in a digital broadcasting receiver.

[0012] Another object of the present invention is to provide an apparatus and method for generating ESG data, and structured EPG data obtained by structuring service channel information of the ESG data and program information of respective service channels, and upon display of the channel information, selectively displaying the ESG data or the structured EPG data depending on user selection in a digital broadcasting receiver.

[0013] To achieve the above and other objects, there is provided an apparatus for displaying channel information in a digital broadcasting receiver, the apparatus including a broadcasting receiver for receiving and demodulating a digital broadcasting signal of a selected channel; a data processor for demultiplexing the demodulated broadcasting signal, separating Electronic Program Guide (EPG) data and broadcasting data, and decoding the broadcasting data; a controller for controlling an operation for analyzing the EPG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, generating structured EPG data, and upon request for displaying the channel information, displaying the EPG data or the structured EPG data by user selection; a memory for storing the EPG data and the structured EPG data under control of the controller, and a display unit for displaying the selected EPG data or structured EPG data as the channel information.

[0014] The structured EPG data includes first EPG data provided corresponding to a number of the service channels, each having service channel information having service channel category and service channel name; and second EPG data having event information broadcasted over the service channel and stored in a broadcasting time sequence, and the event information having a broadcasting start time, a broadcasting time, an event name, and an event summary of a corresponding event.

[0015] The first EPG data further includes a network layer for storing a physical channel identification, broadcasting station information, and a plurality of numbers of the service channels using the physical channel; and service layers provided corresponding to the number of service channels,

each storing a service channel identification, a service channel number, a service category and a service channel name, and the second EPG data includes event layers for each program provided for a corresponding service channel, the event layers provided in a number format corresponding to the respective service channels and each having the broadcasting start time, the broadcasting time, the event name, an event category, and the event summary.

[0016] Upon user request for channel information, the controller controls an operation for displaying the EPG data and the structured EPG data, having access to the EPG data or structured EPG data selected by a user in the memory, and displaying the EPG data or structured EPG data on the display unit, and upon user request for displaying the structured EPG data, the controller displays the first EPG data, and displays the second EPG data of the service channel based on the user's selection.

[0017] In another aspect of the present invention, there is provided an apparatus for displaying channel information in a digital broadcasting receiver, the apparatus including a broadcasting receiver for receiving and demodulating a digital broadcasting signal of a selected channel, and outputting Internet Protocol (IP) datagram data, a data processor for decapsulating IP data of the IP datagram data, separating a service data packet steam or an Electronic Service Guide (ESG) data packet stream, and demultiplexing and decoding the service data packet stream into audio and video data; a controller for controlling an operation for parsing the ESG data packet seam, generating structured ESG data, analyzing the structured ESG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, generating structured EPG data, and upon request for displaying the channel information, displaying the structured ESG data or the structured EPG data by user selection; a memory for storing the structured ESG data and the structured EPG data by the controller, and a display unit for displaying the selected structured ESG data or structured EPG data as the channel information.

[0018] Upon receipt of the ESG data packet stream, the controller parses the ESG data, generates and stores the structured ESG data in the memory, combines channel information data of a service information fragment and an acquisition fragment of the structured ESG data, generates the summary information of the programs of the respective service channels, generates structured first EPG data, combines channel information data of contents fragments and schedule event fragments, and generates structured second EPG data.

[0019] The controller matches a service identification field, a name field, and a genre field of the service information fragment and the acquisition fragment of the structured ESG data to service channel name, category and language, respectively, to generate the first EPG data, and the controller matches a broadcasting start time field of the schedule event fragment of the structured ESG data and a broadcasting field, a title field, a genre field, and a synopsis field of the contents fragment to an event start time, an event broadcasting time, an event name, an event category, and an event summary of the event information to generate and store the structured second EPG data in the memory.

[0020] The controller matches a Session Description Protocol (SDP) field of the acquisition information fragment of the structured ESG data to a network layer of the first EPG data, and matches a service ID field, a service genre field, and a service name field of the service information fragment to corresponding service channel number, service type, and service channel name of a service layer of the first EPG data, respectively, to generate the structured first EPG data, and the controller matches a content identification field and the broadcasting start time field of the schedule event fragment of the structured ESG data to event identification and start time of the second EPG data, respectively, and matches the broadcasting time field, the title field, the genre field, and the synopsis field of the contents fragment to a broadcasting time, an event name, a content level, and an event summary of the second EPG data, respectively, to generate the structured second EPG data.

[0021] Upon user request for the channel information, the controller controls an operation for displaying the structured ESG and structured EPG data, having access to the structured ESG or EPG data selected by a user in the memory, and displaying the structured ESG or EPG data on the display unit.

[0022] In a further aspect of the present invention, there is provided a method for displaying channel information in a digital broadcasting receiver, the method including receiving and demodulating a digital broadcasting signal of a selected channel; demultiplexing the demodulated broadcasting signal, separating Electronic Program Guide (EPG data and broadcasting data, and decoding the broadcasting data; storing the EPG data, analyzing the EPG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, and generating and storing structured EPG data; and upon request for displaying the channel information, displaying the EPG data or the structured EPG data selected.

[0023] The step of generating the structured EPG data includes generating first EPG data provided corresponding to a number of the service channels, each of which has service channel information having service channel category and service channel name; and generating second EPG data having event information broadcasted over the service channel and stored in a broadcasting time sequence, and the event information having a broadcasting start time, a broadcasting time, an event name, and an event summary of a corresponding event.

[0024] The first EPG data further includes: a network layer for storing a physical channel identification, broadcasting station information, and a plurality of numbers of the service channels using the physical channel; and service layers provided corresponding to the number of the service channels, and each storing a service channel identification, a service channel number, a service channel category, and a service channel name, and the second EPG data includes event layers provided for a number of programs of a corresponding service channel, and the event layers are provided in number corresponding to the respective service channels and each has the broadcasting start time, the broadcasting time, the event name, an event category, and the event summary. The step of displaying the channel information includes upon request for the channel information, prompting user selection of the EPG and structured EPG data; upon selection of the EPG data in the above step,

displaying the EPG data as the channel information, and upon selection of the structured EPG data, displaying the structured EPG data as the channel information.

[0025] The step of displaying the structured EPG data includes displaying the first EPG data, and guiding for selection of the service channel; and displaying the second EPG data of the service channel selected in the above step, as the channel information.

[0026] In a further another aspect of the present invention, there is provided a method for displaying channel information in a digital broadcasting receiver, the method including the steps of receiving and demodulating a digital broadcasting signal of a selected channel, and outputting Internet Protocol (IP) datagram data; decapsulating IP data of the IP datagram data, separating a service data packet stream or an Electronic Service Guide (ESG) data packet stream, and demultiplexing and decoding the service data packet stream into audio and video data; parsing the ESG data packet stream, and generating and storing structured ESG data; analyzing the structured ESG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, and generating and storing structured EPG data; and upon request for displaying the channel information, displaying the selected ESG data or the structured EPG data as the channel information.

[0027] The step of generating the structured EPG data includes upon receipt of the ESG data packet stream, parsing the ESG data, and generating and storing the structured ESG data; combining channel information data of a service information fragment and an acquisition fragment of the structured ESG data, generating the summary information of the programs of the respective service channels, generating structured first EPG data, combining channel information data of contents fragments and schedule event fragments, and generating and storing structured second EPG data.

[0028] In the step of generating the first EPG data, a service identification field, a name field, and a genre field of the service information fragment and the acquisition fragment of the structured ESG data are matched to service channel name, category and language, respectively, to generate the first EPG data, and in the step of generating the second EPG data, a broadcasting start time field of the schedule event fragment of the structured ESG data and a broadcasting field, a title field, a genre field, and a synopsis field of the contents fragment are matched to an event start time, an event broadcasting time, an event name, an event category, an event summary of the event information to generate the structured second EPG data.

[0029] The step of displaying the channel information by a user includes prompting user selection of the ESG and structured EPG data, and upon selection of the ESG data, displaying the structured ESG data as the channel information, and upon selection of the EPG data, selecting the structured EPG data as the channel information.

[0030] According to the present invention, there is an effect of selecting an inputted digital broadcasting channel on a display unit of a wireless terminal, and displaying an audio and video display state of the selected channel and program information of respective service channels depending on the user's selection.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

[0032] **FIG. 1** is a block diagram illustrating a construction of a digital broadcasting receiver;

[0033] **FIG. 2** is a block diagram illustrating a construction of a decoder of a digital broadcasting receiver using EPG channel information in **FIG. 1**;

[0034] **FIG. 3** is a block diagram illustrating a construction of a demultiplexer of **FIG. 2**;

[0035] **FIGS. 4A** to **4**C illustrate packet constructions of a broadcasting signal inputted;

[0036] **FIG. 5** illustrates a software construction of a digital broadcasting receiver according to the present invention;

[0037] **FIGS. 6A and 6B** illustrate architecture of an application interface in a digital broadcasting receiver according to the present invention;

[0038] **FIG. 7** illustrates a construction of a user interface screen of a digital broadcasting receiver according to the present invention;

[0039] **FIGS. 8A** to **8**L illustrate examples of a screen construction based on the screen construction of **FIG. 7**;

[0040] **FIG. 9** illustrates a menu layer construction of a digital broadcasting receiver according to the present invention;

[0041] **FIG. 10** illustrates an example of a construction of an EPG table according to the present invention;

[0042] **FIGS. 11A and 11B** illustrate constructions of a high level and a low level of an EPG table having the construction of **FIG. 10**;

[0043] **FIG. 12** illustrates a construction of a broadcasting receiver, including a tuner and a demodulator, of an IP-based digital broadcasting receiver using ESG data as channel information in **FIG. 1**;

[0044] **FIG. 13** is a block diagram illustrating a construction of a data processor of an IP-based digital broadcasting receiver using ESG data as channel information in **FIG. 1**;

[0045] **FIGS. 14A and 14B** illustrate architectures of application interfaces in an IP-based digital broadcasting receiver using ESG data as channel information according to the present invention;

[0046] **FIG. 15** illustrates a construction of a User Interface (UI) screen of an IP-based digital broadcasting receiver using ESG data as channel information according to the present invention;

[0047] **FIG. 16A** illustrates an example of a stream construction of an IP datagram in an IP-based digital broadcasting receiver using ESG data as channel information, **FIG. 16B** illustrates a construction of a service data packet stream in the IP datagram, and **FIG. 16C** illustrates a construction of an ESG data packet stream in the IP datagram;

[0048] **FIG. 17** is a flowchart illustrating a procedure of acquiring a FLUTE payload in the ESG data packet stream of **FIG. 16C**;

[0049] **FIG. 18A** illustrates a construction of an ALC header of an ALC/LCT building block in a FLUTE header of the ESC data packet stream of **FIG. 16C**, and **FIG. 18B** illustrates a construction of a LCT header being the second field in the ALC header of **FIG. 18A**;

[0050] **FIG. 19** illustrates a structure of ESG data in an IP-based digital broadcasting receiver using ESG data as channel information;

[0051] **FIG. 20** illustrates a procedure of extracting and structuring ESG data from an ESG data packet stream, and editing and structuring the ESG data in a format of EPG data according to the present invention;

[0052] **FIG. 21** illustrates a structure of ESG data obtained by parsing XML-structured ESG data;

[0053] **FIG. 22** illustrates a structure of structured EPG data obtained by linking and matching ESG data with a format of EPG data according to the present invention; and

[0054] **FIG. 23** is a flowchart illustrating a preprocessing process of converting structured ESG data of **FIG. 22** into a format of structured EPG data.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0055] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to accompanying drawings. Wherever possible, the same reference numerals will be used throughout the drawings to refer to the same or like parts.

[0056] In the following description, specific details such as a data structure and a broadcasting display screen of a digital broadcasting receiver are provided for a more comprehensive understanding of the present invention. It will be apparent to those skilled in the art that various modifications and variations can be also made in the present invention without the specific details.

[0057] In the present invention relating to a user interface for displaying a digital broadcasting signal in a wireless terminal having a function of receiving digital broadcasting, there are provided the user interface and a construction of the digital broadcasting receiver processing the user interface, for selecting a digital broadcasting function by a user, displaying information of a selected broadcasting channel, and displaying program information of respective broadcasting channels depending on a characteristic of a display unit of the wireless terminal. In other words there are provided the user interface for selecting functions of processing the digital broadcasting, and an Electronic Program Guide (EPG) and Electronic Service Guide (ESG) processing structure for effectively displaying broadcasted program information. In the present invention, structured EPG data is generated in EPG or ESG channel information, and the structured EPG data includes simplified service channel information (hereinafter referred to as "first EPG data") and program information of respective service channel (hereinafter referred to as "second EPG data"). For the first and second EPG data, necessary channel information are extracted and edited from EPG or ESG data, respectively. Accordingly, when the channel information is displayed, the user of the digital broadcasting receiver can fast search for summarized service channel information, and summarized program information of a specific service channel.

[0058] The first EPG data can include service channel information including a category (service type or genre type) and a name (service name) of the respective service channels provided in the digital broadcasting. The second EPG data is preferably provided in number format corresponding to the respective service channels. In the second EPG data of one service channel, program (event or content) data broadcasted over the corresponding service channel are stored in a broadcasting start time sequence. Each of program information of the second EPG data includes a broadcasting start time (start time), a broadcasting time (duration), a program name (event name and title field), and a schematic program summary (text character or synopsis field) of a corresponding program.

[0059] Currently, the digital broadcasting is classified into a Digital Multimedia Broadcasting (DMB) and a Digital Video Broadcasting (DVB). The DMB is classified into a terrestrial DMB and a satellite DMB. The DVB is classified into a Digital Video Broadcasting-Terrestrial (DVB_T) and Digital Video Broadcasting-Handheld (DVB_H). In an embodiment of the present invention, a method for displaying the broadcasting program in the DVB_T and DVB_H broadcastings will be described on the assumption that the digital broadcasting receiver is the DVB_H. In a DVB_T type digital broadcasting signal having a MPEG-2 TS format, packet data of the MPEG-2 TS format are demultiplexed and separated into video, audio, and broadcasting relating information data, and the separated data are processed in set methods, respectively. A DVB_H type digital broadcasting signal has a MPEG TS format including Internet Protocol (IP) information. Accordingly, unlike a DVB_T broadcasting receiver, a DVB_H broadcasting receiver processes IP information in the MPEG TS formatted broadcasting signal, then demultiplexes and separates the packet data of the MPEG TS format into the video, audio, and broadcasting relating information data, and processes the separated data in the set methods, respectively. In an embodiment of the present invention, first, a method for extracting Electronic Program Guide (EPG) data (hereinafter referred to as "broadcasting program data") being broadcasting relating data (hereinafter refereed to as "broadcasting data") of the DVB_T type digital broadcasting signal and displaying broadcasting relating information will be described. Second, a method for extracting Electronic Service Guide (ESG) data (hereinafter referred to as "broadcasting service data") being the broadcasting data of the DVB_H type digital broadcasting signal and displaying broadcasting relating information will be described.

[0060] Hereinafter, the present invention will be in detail described with reference to the accompanying drawings.

[0061] **FIG. 1** is a block diagram illustrating a construction of a digital broadcasting receiver. The construction of **FIG. 1** includes a Radio Frequency (RF) tuner **110**, a demodulator **120**, and a data processor **130** of the digital broadcasting receiver.

[0062] Referring to **FIG. 1**, the digital broadcasting signal can be in a Very High Frequency (VHF) region and/or Ultra High Frequency (UHF) region and/or an L-band signal. If

the user selects the broadcasting channel, a controller **100** outputs control data corresponding to the channel selected in the RF tuner **110**. The RF tuner **110** generates a RF frequency depending on the channel data, mixes the generated RF frequency with the received broadcasting signal, detects a broadcasting channel signal selected by the user, and applies the detected signal to the demodulator **120**. Then, the demodulator **120** receives the broadcasting signal of the selected channel from the RF tuner **110**, and demodulates the received broadcasting signal in a set demodulation method. The demodulator **120** can be an Orthogonal Frequency Division Multiplexing (OFDM) or Coded Orthogonal Frequency Division Multiplexing (COFDM) demodulator. The RF tuner **110** and the demodulator **120** can be broadcasting receivers for receiving, demodulating, and outputting the signal of the broadcasting channel set by the user under control of the controller **100**. It is assumed that the signal outputted from the demodulator **120** is a MPEG-2 Transport Stream (TS) signal, and this signal is applied to the data processor **130**. Then, the data processor **130** demultiplexes the received MPEG-2 TS signal into the video, the audio, and the data, decodes the demultiplexed video and audio data, and outputs the decoded video and audio data as a video signal and an audio signal. The video signal can be a signal of RGB or YUV, and the audio signal is generally outputted in a PCM stereo sound format. The video signal from the data processor **130** is outputted to and displayed on a display unit **150**, and the audio signal is applied to and reproduced in a speaker **160**.

[**0063**] As described above, the DVB_T and the DVB_H are similar in that a transport data structure is a MPEG-2 TS structure but, since the DVB_H processes IP-based broadcasting data, receivers have a mutually different construction. In a description of a structure of the broadcasting data, the DVB_T has the program data EPG of the broadcasted channel. To the contrary, the DVB_H includes not only program data of the broadcasting channel but also multimedia information relating to the broadcasting program and information (e.g. purchase information) for communicating with the broadcasting channel. Accordingly, the ESG being the broadcasting data of the DVB_H has an IP-based transport data format, and includes the program data of the broadcasting channel and a variety of broadcasting related data. In other words, the ESG data includes a traditional channel service, multimedia data (title image, title video, and title audio) information on program contents being broadcasted through the service channel, and purchase information for performing a function of communicating with a broadcasting station or a broadcasting provider. In case where the ESG data is displayed as the information of the broadcasting channel, programs (e.g. events) of several broadcasting channels (e.g. service channels) can be together displayed depending on a broadcasting time sequence. For example, programs of several broadcasting companies such as a broadcasting program of an "A" broadcasting company and a broadcasting program of a "B" broadcasting company can be displayed in the broadcasting time sequence. It is desirable to add a function of displaying programs of a specific broadcasting company in the broadcasting time sequence. The broadcasting channel information can include a variety of information. In this case, it can take a long time to display the broadcasting channel information. Accordingly, it is desirable to generate and display structured EPG data, which includes summary information (referred to as "first EPG data") of the service channel including the broadcasting companies (service channels) provided from the digital broadcasting receiver and information (referred to as "second EPG data) of names, broadcasting times, and summary information of programs (events) provided from the respective broadcasting companies (service channels).

[**0064**] Accordingly, in an embodiment of the present invention, in the digital broadcasting receiver receiving the EPG data, upon receipt of the EPG data, the first and second EPG data are extracted from the EPG data and the structured EPG data is generated, and upon display of the channel information, the EPG data and the structured EPG data can be selected and displayed as the channel information. Further, in the digital broadcasting receiver receiving the ESG data, upon receipt of the ESG data, the first and second EPG data are extracted from the ESG data and the structured EPG data is generated, and upon display of the channel information, the ESG data and the structured EPG data can be selected and displayed as the channel information.

[**0065**] In the following description, methods for arranging the programs on a broadcasting channel-by-broadcasting channel basis in the EPG and ESG data, and effectively summarizing and displaying information of the programs are provided. In the following description, first, a method for processing the EPG data of the DVB_T will be described and then a method for processing the ESG data of the DVB_H will be described.

[**0066**] A procedure of processing the DVB_T type digital broadcasting signal will be described. In the description, a construction of the data processor **130** of the digital broadcasting receiver is utilized with **FIG. 2** illustrating a construction of the data processor **130**.

[**0067**] Referring to **FIG. 2**, the demultiplexer **210** receives the demodulated MPEG-2 TS data outputted from the demodulator **120**, and separates each of the received data into audio, video, and other data. The controller **100** selects and informs of broadcasting information and Program Identification (PID) to be selected in the demultiplexer **210**. Accordingly, the demultiplexer **210** selects target data from a variety of data outputted from the demodulator **120** depending on the selected PID, and separates the selected data into the video and audio. An input buffer **220** is a general queue (capable of being a kind of circular buffer whose construction allows for a First-In First-Out (FIFO) processing and in which input and output are oppositely performed), and stores real-time demultiplexed data corresponding to data processed in a video decoder **230** and an audio decoder **250** of a rear stage. The video decoder **230** decodes the video data. It is generally known that the digital broadcasting receiver receives and converts a video elementary stream (ES) into YUV 4:2:0 data. However, the video data should be outputted adaptively to the display unit (e.g. LCD unit) of the digital broadcasting receiver. Therefore, the video data can be also converted into Red, Green, and Blue (RGB) data. The audio decoder **250** decodes the audio data and, similarly with the decoding of the video data, receives and converts an audio ES into a Pulse Code Modulation (PCM) audio data. The converted PCM audio data is stored in the audio output buffer **260**, and is outputted adaptively to an output time point.

[**0068**] In the digital broadcasting receiver having the above structure, a reception signal can be the TS signal. The

TS signal is generated from a multiplexer of a digital broadcasting transmitter. **FIG. 3** is a block diagram illustrating a construction of the demultiplexer **210** of **FIG. 2**, and **FIGS. 4A** to **4**C illustrate packet constructions of the TS signal inputted.

[0069] A structure of the inputted TS signal will be described with reference to **FIGS. 4A** to **4**C. The TS signal is a packet stream, and includes video packets and audio packets as shown in **FIG. 4A**. The video and audio packets are randomly multiplexed and transmitted in the digital broadcasting transmitter. As shown in **FIG. 4B**, the audio and video packets of **FIG. 4A** include packet header and payload, and the packet header and payload has 188 bytes. In other words, one packet of data has 188 bytes. The packet header has a size of 4 bytes, and respective parameters of the packet header have a function as in Table 1 below.

TABLE 1

Class	Description	bits
Sync byte	Sync byte, 0X47	8
Transport error indicator	When error occurs in a current packet: 1	1
Payload start indicator	When a current packet is a start of PES: 1	1
transport priority	Used in decoder	1
PID	Identifier identifying a kind of a packet	13
scrambling control	Setting a scrambling mode	2
adaptation field control	01: no additional information/ only payload exists 10: only additional information exists/no payload 11: additional information and payload all exist 00: reserve	2
continuity counter	4 byte counter, increasing by 1 for the same PID	4

[0070] In other words, the packet data starts with a sync byte, and on the basis of the sync byte, one packet is distinguished. A sync search unit **311** (**FIG. 3**) searches for the inputted packet data and detects the sync byte, and upon detection of the sync byte, buffers subsequently inputted packet data to the buffer **323**. Then, the buffer **323** buffers the inputted packet data. The buffer **323** can be a 188-byte buffer having a packet size, a 376-byte (2×188 bytes) buffer having an integer of the packet size, a 564-byte (3×188 bytes) buffer, or the like. As described in the Table 1, the packet headers of 4 bytes are buffered to first to fourth byte positions of the buffer **323**.

[0071] Then, a packet header processor **313** of **FIG. 3** processes the packet header shown in **FIG. 4B** and described in Table 1, and compares a PID representing stream information of the video/audio signal of the set broadcasting channel with a PID of the TS signal outputted from the buffer **323**, decides whether or not to process the received packet, and controls not to process the packet buffered to the buffer **323** when the packet is not the set PID. The PID is used as information for identifying a Network Information Table (NIT), a Service Description Table (SDT), and the audio or video packet of the broadcasting channel in a following packet. The NIT is a frequency channel information table of a digital broadcasting station, and the SDT is a broadcasting channel table provided for a frequency channel. Accordingly, if the user selects a predetermined digital broadcasting channel, the controller **100** first receives the NIT and confirms the frequency channel used by the selected broadcasting channel and then controls the RF tuner **110** to fix a RF channel to a frequency of the selected broadcasting channel. In the digital broadcasting, a plurality of broadcasting channels are provided to one frequency channel, and the one frequency channel is shared and used by the plurality of broadcasting channels. Accordingly, the NIT includes information for distinguishing the audio and video ESs of the plurality of broadcasting stations using the one RF channel, and the controller **100** decides the audio and video PIDs of a user's desired broadcasting channel with reference to the SDT. The demultiplexer **210** searches for the PID of the received packets and, only when the searched PID is the decided PID, demultiplexes the inputted packets.

[0072] Accordingly, if the packet is buffered to the buffer **321**, the packet header processor **313** analyzes the PID of the buffered packet header and, if it is analyzed to be the PID for identifying the NIT or not, transmits packet data of 5^{th} to 188^{th} bytes buffered to the buffer **321**, to the controller **100**. Then, the controller **100** analyzes the NIT and then controls the RF tuner **110** to fix the RF channel to the frequency channel of the broadcasting station selected by the user. After that, upon receipt of the SDT identifying PID, the packet header processor **313** also transmits the packets buffered to the buffer **321**, to the controller **100**. Next, the controller **100** receives the audio and video identifying PIDs of the selected broadcasting station, and decides the received PIDs as target PIDs. After that, the packet header processor **313** analyzes the set target PIDs, and demultiplexes the received packets of the broadcasting station.

[0073] If the target PID is decided as described above, upon receipt of the packet, the packet header processor **313** checks whether the PID of the packet header is the set PID. If the PID of the buffered packet is found not to be the set PID, the packet header processor **313** does not perform a process of demultiplexing the inputted packet. However, if the PID of the inputted packet header is the set PID, the packet header is analyzed. If the packet buffered to the buffer **321** has the same value as the set target PID, the packet header processor **313** analyzes the packet header and controls operations of processors **315** to **319** depending on an adaptation field control.

[0074] The packet header processor **313** extracts and processes the packet header from the buffer **321**, and outputs remaining data excepting the packet header, to the buffer **323**. The adaptation field processor **315** extracts and processes an adaptation field from the buffer **323**, and outputs remaining data, except the adaptation information, to the buffer **325**. A PES header processor **317** extracts and processes PES header information from the buffer **325**, and outputs remaining information excepting the PES header, to the buffer **327**. A data processor **319** has access to data from the buffer **327**, and converts the data of the buffer **327** into the video ES or the audio ES depending on the PID information transmitted form the controller **100**, and demultiplexes and outputs the converted video ES or audio ES to the corresponding video decoder **230** or the audio decoder **250**, respectively.

[0075] As above, the demultiplexer **210** analyzes the inputted packets and, when the analyzed packet is the NIT and SDT packets, transmits the buffered packet to the

controller **100**. When the analyzed packet is payload data of the packet-set PID, the demultiplexer **210** processes the analyzed packets through the corresponding additional information processor **315**, the PES header processor **317**, and the data processor **319**, respectively, and demultiplexes and transmits the processed packets to the corresponding data processor **130** (**FIG. 1**).

[**0076**] In the digital broadcasting receiver having the above construction, its software structure can be mainly distinguished into an Application Programming Interface layer (hereinafter referred to as "API layer") **413** (**FIG. 5**), and an application layer **411**. The application layer of the digital broadcasting receiver is operated on the basis of a set of the prepared API collected, and controls hardware layer DTV receiver**417** of the digital broadcasting receiver and processes an inputted TS stream. Hardware **427** such as a display (LCD), a keypad, and an audio processor is controlled to share hardware of the wireless terminal. A physical layer of the digital broadcasting receiver such as the hardware layer **417** can be the RF tuner **110**, the demodulator **120**, and the data processor **130** of **FIG. 1**, and the hardware **427** can be the key input unit **170**, the speaker **160**, and the display unit **150**.

[**0077**] Referring to **FIG. 5**, the DTV receiver **417** can be divided into several parts on the basis of network connection. An enhanced broadcasting receiver provides broadcasting where graphic, image, and text are included in the broadcasting signal. Further, a function of a return channel can be supported in other hardware functions such as GSM and CDMA. For this, the hardware **417** of the digital broadcasting receiver supports a local viewer (player) and linkage function, a graphic processing function, and an audio-video stream selecting function. An interactive broadcasting receiver including the return channel makes it possible to communicate with a head-end or a server, and makes it possible to add various applications such as an electronic commerce, an electronic mail (e-mail), and a chatting service. The return channel can be used to, in the course of viewing program, transmit product purchase information, viewer's opinion on the program, viewer's game information when the program supporting a game, and a viewer's message relating to program viewing or message not relating to the program, to the broadcasting station or the server. The return channel can be a RF communication using a RF communication unit **190**.

[**0078**] The application layer **411** provides applications selecting a TV program besides a general TV broadcasting and displaying program information in the digital broadcasting receiver, and it is expected to provide applications of more various formats in the future. The application layer **411** mainly processes a digital broadcast play function (DTV player), an Electronic Program Guide (hereinafter referred to as "EPG"), and program-specific applications. First, the digital broadcast play function refers to a function of receiving and playing actual broadcasting video and audio for the TV program of the general DTV broadcasting so that the user can view the TV program. The EPG provides DTV program schedule information to the user, and provides a function of allowing the user to select his/her desired program and to view the selected program. Through the EPG, a preview screen of a local channel of each broadcasting station can be also provided. The program-specific applications provide a specific application adapted to the DTV program format. For example, the program-specific applications can be programmed for displaying information on a specific player while the user plays a game, views a TV program or views sports program. In the application, the program-specific applications are ended when the user performs a program change (channel change). Even a chatting program belongs to the program-specific applications.

[**0079**] The API layer **413** provides a function of performing an operation of the application layer **411** operated in the digital broadcasting receiver. As the API layer **413**, there are TV program access, service selection, application life cycle management, and broadcasting data access. First the TV program access is a function of allowing the application layer **411** to have access to the program information provided to the user, in order to select the service (TV program). The TV program access function is managed by a SI manager to have access to a Service Information (SI) database (DB). The service selection provides a function of selecting and displaying a user viewing service from a plurality of services, including up to an executing application to be used in the corresponding service. Describing the application life cycle management function, an application life cycle refers to several status variations from initialization to extinction. The application life cycle management function is managed by an application manager with reference to an Application Information Table (AIT). The broadcasting data access controls a file system and streaming data of the A/V stream and a separate data stream through the demultiplexer **210**.

[**0080**] **FIGS. 6A and 6B** illustrate API architectures of the wireless terminal having the digital broadcasting receiver. **FIG. 6A** illustrates the API architecture where the RF tuner **110**, the demodulator **120**, and the data processor **130** are embodied in hardware, and **FIG. 6B** illustrates the API architecture in case where the RF tuner **110** and the demodulator **120** are embodied in hardware, and the data processor **130** is embodied in software.

[**0081**] Referring to **FIG. 6A**, for each the audio/video decoder or the SI decoder, a controller exists (capable of being a Dynamic Link Library (DLL) format of the wireless terminal), and a manager for managing the tuner is equipped. Each of them is controlled by a class type interface, and the interfaces are collected to provide Application Programming Interfaces (APIs), respectively. Properties of the respective APIs will be described below.

[**0082**] First, channel control APIs will be described. The channel control APIs provide a function of controlling the demultiplexer **210** by a PID value through the tuner **110** and initiating the service. Further, the channel control APIs provide a function of searching for a physical channel at a frequency bandwidth and inputting a Transport Stream (TS) of the broadcasting for a desired frequency. Third, service information control APIs are stored in a Service Information Table (SIT), and provide a variety of EPG information and other information on the service. Third, audio & video control APIs provide a function of variously displaying desired audio and video parts through a multimedia application interface or a video streaming interface of an operating system. Further, the audio & video control APIs also provide a function of storing a desired scene as an image file on the air. In the channel control APIs, functions capable of being actually provided are decided depending on performances of the tuner **110** and the demodulator **120**.

[0083] First, the channel control APIs will be described.

[0084] The channel control APIs include a tuner control manager and a tuner control interface. The tuner control interface being an access format of the tuner control manager is provided to control the tuner **110** and the demodulator **120**. The demultiplexer **210** is given access and the TS signal divided through the PID is newly matched to a data source format, respectively. In this manner, the tuner **110** is controlled to provide a corresponding physical channel and the demultiplexer **210** is controlled to provide stream data of a corresponding service.

[0085] A class of the tuner control manager is generally provided to have the DLL format The DTV tuner control interface provides a class for having access to the DTV tuner controller and controlling channel relating functions.

[0086] Second, the service information control APIs require the SIT for performing a function of updating the EPG relating information and the service information to the SIT through the SI decoder and a function of taking information on a specific portion from the SIT, and a SI controller (SI manager) for the SI decoder. The application embodies an interface portion for using the SI controller.

[0087] Third, the audio & video control APIs provide the following functions to process A/V streaming. A "VideoStreamplayerUtility" class has access to a format decoder and a codec portion set for the MPEG-2 TS through a "VideoStreamController" class, and controls a video stream.

[0088] As shown, the API architecture of **FIG. 6A** illustrates a case where the tuner **110**, the demodulator **120**, and the data processor **130** (including the demultiplexer **210**, the video decoder **230**, and the audio decoder **250**) are provided in hardware. However, as shown in **FIG. 6B**, in the API architecture, the tuner **110** and the demodulator **120** is provided in hardware, and the data processor **130** can be also provided in software. In other words, as shown in **FIG. 6B**, a demux module and an audio & video decoder are operated in software. Each module of the demultiplexer, the decoder, and the SI decoder can be provided in hardware or software. Even in the digital broadcasting receiver having the architecture of **FIG. 6B**, the above API architecture is provided, and the same operation is also performed.

[0089] The application of the digital broadcasting receiver refers to an application showing not only a video relating portion such as a broadcasting view function, a video change function, and a service channel change function but also information on a schedule table for each service being a so-called EPG or a broadcasting program event.

[0090] The functions of the application of the digital broadcasting receiver include an initial screen and channel search function, a broadcasting view and audio/video option setting function, and an EPG information view function.

[0091] **FIG. 7** illustrates a construction of a UI screen of the digital broadcasting receiver according to an embodiment of the present invention, and **FIGS. 8A** to **8**L illustrate examples of the screen construction of **FIG. 7**. Here, numerals (1, 1.1, 1.1.1, 1.1.2, 1.1.1.1, ...) shown in front of **FIG. 7** correspond to numerals shown in **FIGS. 8A** to **8**K.

[0092] First, the initial screen and channel search function will be described. In first execution, as shown in **FIG. 8A**, a menu is displayed, and a channel corresponding to a basic frequency is searched. If channel search is again performed, when option and search channel are selected in sequence, the channel is again displayed and the searched service is updated. If the channel is selected, a screen of the channel selected as shown in **FIG. 8B** is displayed on the display unit **150**.

[0093] Second, the broadcasting view and audio/video option setting function will be described. If the user selects the channel on a select menu and presses an OK key, the broadcasting is just initiated. As shown in **FIG. 8C**, while the user views the broadcasting, he/she presses an option key (left soft key of a display screen as shown in **FIG. 8C**). If so, it is in a pause state, and in this state, the user can change audio and video setting as in Table **2** and then can keep viewing.

TABLE 2

Close DVB Player	Returning to a channel selection screen in a paused state.
Capture Video Frame	Capturing and storing a video screen in play as a picture.
Video preferences	Controlling a current video display screen. brightness, contrast, color controllable display size (support only three kinds) Small(½), Normal, Full Screen Size
Audio preferences	Up or down a volume of audio in play. Mute (no sound) is also possible
View EPG information	Converting into an EPG information screen. Stopping a player itself. That is, changing an execution program into an EPG program.
Change a Channel	Stopping a process of a current stream, and returning to a channel selection screen.

[0094] In case where it is intended that a screen is captured and stored as a still image as in the Table 1, "capture video frame" is selected in an option menu as shown in **FIG. 8C**. Then, as shown in **FIG. 8D**, the video image displayed on the display unit **150** is displayed as the still image and a window for inputting a file name is displayed. If the file name is inputted, the displayed still image is stored in a memory. In case where it is intended to change the currently displayed screen, "video preferences" is selected in the option menu as shown in **FIG. 8C**. Then, as shown in **FIG. 8E**, a menu capable of selecting brightness, contrast, color, and size is displayed, and a desired function is selected in a menu shown in **FIG. 8E**. In case where the size is selected, as shown in **FIG. 8F**, a screen size capable of being selected by the user is displayed, and a video having the screen size based on user's selection is displayed on the display unit **150**. In case where audio is set, as shown in **FIG. 8G**, a function of audio volume or mute can be set. The user can change the channel in an option screen shown in **FIG. 8C**. If the user selects "change a channel" on the option screen, the controller **100** displays a channel select menu as shown **FIG. 8H**. If a channel is selected from the displayed menu, as shown in **FIG. 8L** the selected channel is searched, and the channel search operation is displayed.

[0095] The user can confirm programs of the selected service channel. If the user selects "View EPG information" on the option screen displayed as shown in **FIG. 8C**, as shown in **FIG. 8J**, the controller **100** changes an EPG program to an execution program while pausing and converting a played screen into an EPG information display screen, and displays the EPG information display screen as

shown in **FIG. 8J**. If the user selects a desired event in a state of displaying events of the service channel as shown in **FIG. 8H**, the controller **100** displays detailed information on the selected event as shown in **FIG. 8K**. In other words, if the user selects an EPG function in a state of displaying the broadcasting of the selected service channel as shown in **FIG. 8L**, programs of the present selected service channel are displayed. If a specific program is selected, the controller **100** displays detailed information such as a name, a start date, a start time, and a duration time of the selected program.

[**0096**] Accordingly, as shown in **FIGS. 8A** to **8L**, menus of applications of the digital broadcasting receiver have structures of **FIG. 9**. In other words, if the application of the digital broadcasting receiver is selected from a main menu, a channel select menu is displayed. If the channel is selected, the broadcasting of the selected channel is displayed on the screen. In this state, the user can select options of the broadcasting view, or display the channel search function for changing the channel, and the EPG. The option functions of the broadcasting view can provide five options as described above. If an arbitrary option is selected from the five options, downlink menus are displayed to allow the user to set a function of the selected option. If the EPG function is selected, the controller **100** displays the EPG information of the selected channel, and if an arbitrary event of the displayed EPG information is set, the controller **100** displays detailed information on the selected event.

[**0097**] Here, a structure and functions of the EPG information will be described.

[**0098**] **FIG. 10** illustrates an EPG structure according to an embodiment of the present invention. The inventive EPG structure includes a basic layer, a network layer, a service layer, and an event layer. The basic layer includes basic information on the EPG, and has information on a time and a country. The network layer includes information on the physical channel (frequency channel), and the physical channel information is acquired through a Network Information Table (NIT). The event layer includes respective program information of the service channel, and the program information is acquired through an Event Information Table (EIT).

[**0099**] The basic layer, the network layer, and the service layer of **FIG. 10** are EPG information of a high level, and the event layer is EPG information of a low level. The network layer is information of the physical channel, and the information of the service layer is information of the service channels using the physical channel. For example, British Broadcasting Corporation (BBC) uses one physical channel (frequency channel), and the physical channel of the BBC includes BBC1, BBC2, and BBC news channels that are a plurality of service channels. Korean Broadcasting System (KBS) uses one physical channel. The service channels using the physical channel of the KBS can be KBS1, KBS2, KBS drama, KBS sports, KSB1 FM, and KBS2 FM. The respective service channels have respective broadcasting schedule and program information. The schedule and program information are event information.

[**0100**] The EPG data includes information of all broadcasting channels and therefore, needs a long time when the EPG data is displayed on the display unit **150**. Accordingly, where the user confirms a specific program of a specific service channel from the EPG data, a time and a procedure can be complicated. Accordingly, in the present invention, there is provided a method for grouping the service channels of the EPG data on a per-group basis, and editing and displaying program data of the service channels. In an embodiment of the present invention, the service channels using the same physical channels are grouped in one, and information of the grouped service channels are summarized and stored. The summary information of the service channel can be an identification (ID) of the service channel, a logical channel number, a service type, and a service channel name. The program information broadcasted in the respective service channels are summarized and stored. The program data of the service channel can be stored in a time sequence, and the summary information of the program can be the program identification, a program start time, a broadcasting time, a program name, a program category, a viewer's age, and a brief program description. For example, it is assumed that the broadcasting using the same physical channel is the KBS, and it is assumed that the service channels of the KBS are KBS1, KBS2, KBS drama, KBS sports, KBS cinema, KBS foreign broadcasting, KBS FM1, and KBS FM2. In this case, in the wireless terminal, upon receipt of the EPG data, the service channels (KBS1, KBS2, KBS drama, KBS sports, KBS cinema, KBS foreign broadcasting, KBS FM1, and KBS FM2) using the same physical channel frequency in the EPG data are grouped as shown in **FIG. 11A**, and the summary information of the service channel includes an ID of the respective grouped service channel, a channel number, a service type, and a service channel name. The service channels store the program information broadcasted in a corresponding service channel in a sequence of a broadcasting time as shown in **FIG. 11B**. The program summary information of the service channel can include the program identification (ID), a program start time, a broadcasting time, a program name, a program category, a viewer's age, and program description data. The structure of **FIG. 11B** can be constructed to correspond to the number of service channels.

[**0101**] Accordingly, upon receipt of the EPG data, in the controller **100**, the EPG data is edited and stored in the memory **180** as shown in **FIGS. 11A and 11B**. Where the user selects an EPG display function, the summary information of the service channels having structure of **FIG. 11A** are displayed. If a specific service channel is selected from the displayed summary information, program data of the selected service channel having structure of **FIG. 11B** can be displayed. After the summarized service channels of **FIG. 11A** are displayed, the summarized program data of the respective service channels shown in **FIG. 11B** can be displayed. In this case, it is a state where the information of the service channel and the program information of the respective service channels are summit and stored and therefore, the controller **110** can display the service channels and the programs of the respective service channels within a short time. The received EPG data can be stored in the memory **180** as it is without change. In this case, the stored EPG data or the program data of **FIGS. 11A and 11B** according to an embodiment of the present invention can be also selected and displayed. In other words, when the EPG display function is selected, the controller **100** can also display the received EPG data as it is.

[**0102**] As described above, the digital broadcasting receiver according to an embodiment of the present inven-

tion has a construction of **FIG. 1**, and upon receipt of the EPG data, the controller **100** converts the received EPG data into the structured EPG data of **FIGS. 11A and 11B** and stores the structured EPG data in the memory **180**. If the user of the digital broadcasting receiver requests display of the channel information, the controller **100** guides for selection of the EPG data or the structured EPG data and displays the selected EPG data as the channel information on the display unit **150**.

[**0103**] Accordingly, in a description of the above operation with reference to **FIG. 1**, the broadcasting receiver including the tuner **110** and the demodulator **120** demodulates the digital broadcasting signal of the broadcasting channel selected by the user under control of the controller **100**. The demodulated broadcasting signal becomes a tort stream including packet data of a MPEG-2_TS structure. As described above, the tuner **110** and the demodulator **120** can be a broadcasting receiver. Then, the data processor **130** demultiplexes the demodulated digital broadcasting signal, and separates the EPG data including the channel information and the broadcasting data of the audio and video data. The audio and video decoder within the data processor **130** decodes the audio and video data, respectively. The decoded audio and video data is played through the speaker **160** and the display unit **150**, respectively.

[**0104**] The controller **100** receiving the EPG data analyzes the EGP data, generates the summary information on a service channel-by-service channel basis, generates the summary information of the programs of the respective service channels, generates the structured EPG data, and stores the generated EPG data in the memory **180**. The decoding of the EPG data can be performed in the controller **100** in the SI decoders of **FIGS. 6A and 6B**. Subsequently, if the user of the digital broadcasting receiver requests for displaying the channel information, the controller **100** generates the EPG data or the structured EPG data by the user's selection, and displays the generated EPG data on the display unit **150**. As described above, in the digital broadcasting receiver according to an embodiment of the present invention, when the channel information is displayed, the EPG data can be displayed by the user's selection and, after the names of the respective service channels are processed in the digital broadcasting receiver, the broadcasting programs of the service channel can be displayed on a broadcasting time-by-broadcasting time basis depending on the user's selection.

[**0105**] The structured EPG data generated by the controller **100** can include fist EPG data and second EPG data. The first EPG data is provided for each service channel and has the respective service channels having service channel information including service channel category and name. The second EPG data has the broadcasted event information of the service channel stored in a sequence of broadcasting time, and has the event information including a broadcasting start time, a broadcasting time, and an event name and summary of a corresponding event.

[**0106**] The first EPG data can include the network layer and the service layers. The network layer stores numbers of a plurality of service channels using the identifier of the physical channel, broadcasting station information, and the physical channel. The service layers are provided corresponding to the number of the service channels and each stores a service channel identifier, a service channel number, a service category, and service channel names. The second EPG data can include event layers corresponding to the number of programs of a corresponding to each service channel. The number of event layers corresponds to the respective service channels and each includes the event broadcasting start time, the event broadcasting time, the event name, an event category, and the event summary.

[**0107**] When the structured EPG data is displayed on the display unit **150**, upon user's request for the channel information, the controller **100** displays a menu for guiding for selecting the channel information intended to be displayed, from the EPG and the structured EPG data, on the display unit **150**. After that, if the user selects the EPG or structured EPG data, the controller **100** has access to the channel information selected in the memory **150** and displays the selected channel information on the display unit **150**. Where the structured EPG data is displayed as the channel information, the controller **100** displays the first EPG data on the display unit **150**, thereby displaying the service channel summary information including the names of the service channels provided in the digital broadcasting receiver. If the user selects a specific service channel from the service channel summary information, the controller **100** has access to the second EPG data of the selected service channel in the memory **150** and displays the second EPG data on the display unit **150**.

[**0108**] The digital broadcasting receiver displaying the EPG and structured EPG data as the channel information can be mounted on the wireless terminal.

[**0109**] **FIG. 11A** illustrates EPG information structure of a high level of **FIG. 10**.

[**0110**] Referring to **FIG. 11A**, first "current time", "local_time_offset", and "country code" are information of the basic layer. The "current time" denotes a current time of an area where a viewer is positioned, the "local_time_offset" denotes a time offset value representing a difference between the current time and a time of an area where a broadcasting station is positioned, and the "country code" denotes information of an area or a country where the viewer is positioned.

[**0111**] Second, "transport_stream_id", "original_network_id", "terrestrial delivery system", and "number of service" being information of the network layer are information acquired in the NIT. The "transport_stream_id" being an ID of the TS signal can be described by the ID of the NIT, and the "original_network_id" being a network ID of the broadcasting system (originating delivery system) can be a broadcasting station ID. The "terrestrial delivery stream" being the broadcasting station information includes a center frequency of 32 bits, a bandwidth of 3 bits as in Table 3 below, a constellation of 2 bits as in Table 4 below, hierarchy information of 3 bits as in Table 5 below, a code rate as in Table 6 below, a guard interval of 2 bits as in Table 7 below, and a transmission mode of 2 bits as in Table 8 below. The "number of service" denotes number of the service channels included in the physical channel. In other words, where the physical channel is the BBC, the "number of service" can be three, and where the physical channel is the KBS, it can be six.

TABLE 3

Bandwidth	Bandwidth value
000	8 MHz
001	7 MHz
010	6 MHz
011 to 111	Reserved for future use

[0112]

TABLE 4

Constellation	Constellation characteristics
00	QPSK
01	16-QAM
10	64-QAM
11	Reserved for future use

[0113]

TABLE 5

Hierarchy_information	α value
000	Non-hierarchical
001	α = 1
010	α = 2
011	α = 4
100 to 111	Reserved for future use

[0114]

TABLE 6

Code_rate	Description
000	1/2
001	2/3
010	3/4
011	5/6
100	7/8
101 to 111	Reserved for future use

[0115]

TABLE 7

Guard_interval	Guard interval values
00	1/32
01	2/16
10	1/8
11	1/4

[0116]

TABLE 8

Transmission_mode	Description
00	2k mode
01	8k mode
10 to 11	Reserved for future use

[0117] Third, "service_id", "logical_channel_number", "service_type", "service_name_length", and "service_name_char. " being information of the service layer are obtained by the SDT. The service layer is provided as much as the number of the service channels ("number of service") belonging to the physical channel. In other words, "N" of **FIG. 10** is the number of the service channels (number of service). The "service_id" being the identifier of the service channel is uniquely assigned every service channel. The "logical_channel_number" denotes a service channel number. The "service_type" denotes a service category, and has service format coding as in Table 9 below. The "service_name_length" denotes number of characters of a service name, and the "service_name_char." denotes a service channel name. The number of the service layers are provided as much as the number of the service channels included in the NIT information as described above.

TABLE 9

Service_type	Description
0x00	Reserved for future use
0x01	Digital television service
0x02	Digital radio sound service
0x03	Teletext service
0x04	NVOD reference service
0x05	NVOD time-shifted service
0x06	Mosaic service
. . .	. . .
0x10	DVB MHP service
0x11 to 0x7F	Reserved for future use
0x80 to 0xFE	User defined
0xFF	Reserved for future use

[0118] The above structure being the high level information of the EPG includes the current time, the channel number, and the service names, and stores only actual TS in a high level formation. The service layers are provided as much as the number of the service channels belonging to the physical channel, and has the country code for controlling a Graphic User Interface (GUI).

[0119] **FIGS. 11A & 11B** illustrate constructions of a high level and a low level of an EPG table having the construction of **FIG. 10**.

[0120] Referring to **FIGS. 11A & 11B**, "transport_stream_id", "original_network_id", and "service_id" are information of the physical and service channels for the service channel of the low level. Specific events of the service channel are EPG information for one event of "event_id", "start_time", "duration", "event_name_length", "content_level", "rating", "text_char_length", and "text_char". The "event_id" is the program id, the "start_time" is a time at which the program starts, the "duration" is a time for which the program is broadcasted, the "event_name_length" is number of characters of the program name, the "content_level" is the program category representing news, sports, and drama, and the "rating" denotes a viewable age. The "text_char_length" is number of characters of a summary text of the program, and the "text_char" is a content text of the program. The "text_char" can be a plot in the datagram, and can be a corresponding sports summary content such as an event, a team and a player in the sports. The above event information is provided for each of the number of the programs of the corresponding service channel. In the displaying of the event information, the events broadcasted after lapse of a time set by the user can be displayed as much as a set number. If the user does not select

the time, the event information as much as the number set from the current time are displayed.

[0121] As described above, the event information display the event name, the start time, the broadcasting time, the program category, preference, and program summary. The event information are displayed as much as the number set by the user. As described above, in a broadcasting data displaying method according to an embodiment of the present invention, as shown in **FIG. 11A**, the summary information (channel number and broadcasting channel name) of the service channels provided in the physical channel are displayed. In a method for displaying the broadcasting program information provided in the respective service channels, as shown in **FIG. 11B**, the program information of the corresponding service are displayed. The respective service channels have the EPG information of the structure of **FIG. 11B**. Accordingly, if the user selects to display the information of the service channels provided at a specific physical channel frequency, the controller **110** has access to the high EPG information having the structure of **FIG. 11A** in the memory **180**, and displays the high EPG information on the display unit **150**. If the user selects to display information of a specific service channel, the controller **110** has access to the low EPG information of the corresponding service channel having the structure of **FIG. 11B** in the memory **180**, and displays the low EPG information on the display unit **150**. Accordingly, the user of the wireless terminal can confirm the service channel information of the summarized physical channel and the broadcasting program information of the specific service channel.

[0122] A procedure of displaying the broadcasting information of the DVB_H type digital broadcasting receiver will now be described.

[0123] The EPG data is the broadcasting program data used in a DVB_T type digital broadcasting. The EPG data mainly includes broadcasting relating program information. However, the ESG data used in the DVB_H type digital broadcasting includes a variety of information including multimedia data besides program information. The ESG data provides the channel service information included in the EPG and multimedia data of the program broadcasted over the channel. The multimedia data can be a title image, a title video, and a title audio. The ESG data includes information for providing a bi-directional communication service, and the information can be purchase relating information, information for participating in the broadcasted program, and information for executing a game when the broadcasted program is concurrent with the game.

[0124] Where the ESG data is displayed, the program information of the service channels are arranged and displayed at each broadcasting time zone. Accordingly, it is desirable to display the broadcasting program information of the ESG data in format as in the EPG broadcasting program. For this, in case where the broadcasting program information is displayed from the ESG data, the ESG data should be edited in order to display the service channel and the program information of the service channel. In the following description, a method for editing the ESG data and displaying the broadcasting program information of the respective service channels will be described.

[0125] Unlike the EPG data, the ESG data has a data format based on the IP information. Accordingly, a construction of a DVH_H type digital broadcasting receiver for receiving the ESG data will be described. The DVB_H type digital broadcasting receiver has the same construction of **FIG. 1**. However, the DVB_H type digital broadcasting receiver receives IP-based MPEG-TS data and therefore, the demodulator **120** and the data processor **130** have a different construction from the DVB_T type digital broadcasting receiver. Accordingly, constructions of the demodulator **120** and the data processor **130** of the DVB_H type digital broadcasting receiver will be described, and an operation of processing the ESG data will then be described.

[0126] **FIG. 12** illustrates the constructions of a tuner **110** and the demodulator **120** of the DVB_H type digital broadcasting receiver.

[0127] Referring to **FIG. 12**, a Phase Locked Loop (PLL) **515** of the tuner **110** generates a frequency for setting a physical frequency of the broadcasting channel under control of a Reduced Instruction Set Computer (RISC) **527**. A mixer **513** mixes a received broadcasting signal and an output frequency of the PLL **515**, and outputs a broadcasting signal of a set physical channel frequency. A filter **517** filters a signal of a set physical channel frequency band. An analog-to-digital converter **521** of the demodulator **520** converts an output signal of the tuner **110** into digital data. An Orthogonal Frequency Division Multiplexing (OFDM) demodulator **523** demodulates a modulated broadcasting signal. A PID filter **525** filters a signal having a PID of the set broadcasting channel from the demodulated signal. The signal outputted from the PID filter **525** is buffered in a buffer **529** through the RISC **527**. The RISC **527** controls a time slicing operation to reduce power consumption of the digital broadcasting receiver, and performs a Multi-Protocol Encapsulation Forward Error Correction (MPE-FEC) function for correcting error generated in reception and improving a reception rate. Data buffered in the buffer **529** is an IP datagram.

[0128] The tuner **110** employs a direct conversion type tuner. The tuner **110** selects the broadcasting signal having the frequency of the set broadcasting channel, and converts the selected broadcasting signal into an In-phase and Quadrature (I/Q) signal. The demodulator **120** converts an output of the tuner **110** into digital data, and demodulates the digital data in an OFDM method. The demodulated data has the MPEG-2 TS structure, and data having the PID of the set broadcasting channel is filtered. The PID filtered data has the time slicing and MPE-FEC function. The time slicing is a technique adopted to reduce the power consumption of the hardware in the digital broadcasting receiver where, only when desired broadcasting data is received, the hardware is operated and, when the desired broadcasting data is received, the hardware is off Accordingly, if the time slicing technique is used, only the desired broadcasting PID data is outputted. Accordingly, in the MPEG-2 TS demultiplexing process performed during the PID filtering process, the signal of the user's set broadcasting channel of several broadcasting channels using the same physical channel frequency is demultiplexed. The MPEG-2 TS demultiplexing process is differently operated from the MPEG-2 TS demultiplexing performed in the multi data processor **130**. If the MPEG-2 TS demultiplexing is performed, a FEC table including only MPE table and parity information can be acquired. The MPE table and the FEC table are used to perform the MPE-FEC function.

[0129] Accordingly, in the RISC **527**, the IP datagram being data obtained by performing the MPEG-2 TS demultiplexing and MPE-FEC processes is transmitted to the multi data processor **130**, so that the broadcasting is played.

[0130] Then, after the data processor **130** receives the IP datagram from the demodulator **120** and decapsulates the IP information, it demultiplexes the decapsulated IP information and processes the audio and video data. **FIG. 13** illustrates a construction of the data processor **130**.

[0131] Referring to **FIG. 13**, an IP decapsulator **550** processes the IP information in the IP datagram outputted from the demodulator **120**, and generates a service data packet stream and an ESG data packet stream. A payload of the service data packet stream is transmitted to the demultiplexer **210**, and the ESG data packet stream is applied to the controller **100**. The payload of the service data packet stream applied to the demultiplexer **210** is the same data as that of **FIG. 4A** and is provided in a packet format. Accordingly, in a subsequent process operation after the demultiplexer **210**, the same process as that of **FIG. 2** is performed. In other words, in the service data packet stream, the IP information is decapsulated and audio and video packets are processed using the same construction and method as the DVB_T. However, in the ESG data packet stream, a process is performed in a method different from the EPG. A method for processing the ESG data will be described later.

[0132] **FIGS. 14A and 14B** illustrate structures of application interfaces in the DVB_H type digital broadcasting receiver according to an embodiment of the present invention. **FIGS. 14A and 14B** illustrate the API architectures of the wireless terminal including the digital broadcasting receiver. **FIG. 14A** illustrates the API structure where the RF tuner **110**, the demodulator **120**, and the data processor **130** are embodied in hardware, and **FIG. 14B** illustrates the API architecture where the RF tuner **110** and the demodulator **120** are embodied in hardware, and the data processor **130** is embodied in software. Other than the PSI/SI decoder & controller, **FIGS. 14A and 14B** are the same in API architecture as **FIGS. 6A and 6B**, and is the same even in operation. The PSI/SI decoder & controller having constructions of processing the EPG data will be described in detail below.

[0133] The application of the digital broadcasting receiver includes the initial screen and channel search function, the broadcasting view and audio/video option setting function, and the ESG information viewing function. **FIG. 15** illustrates a construction of a UI screen of the DVB_H type digital broadcasting receiver according to the present invention.

[0134] Referring to **FIG. 15**, the ESG provides a method for providing a service being the traditional channel information and a method for providing a schedule event (ScheduleEvent) being content (traditional program) information based on time for channel selection. Accordingly, the digital broadcasting receiver can provide all of two methods for the channel selection.

[0135] In the ESG, a channel of a traditional television is expressed as a term "service". Information on the service is transmitted through the ESG and, the ESG can lead the user to the channel selection. This method employs a UI construction for the users familiar with the traditional channel selection, and can reduce confusion occurring when the users who have selected the channel through the EPG informatized on the basis of the channel select the broadcasting through the ESG informatized on the basis of event of the program (content). The information on the service used to lead to the channel selection can be "ServiceNumber", "ServiceName", "ServiceLogo", and "ServiceProvider", and each of them refers to a channel number, a channel name, a representative logo image of the channel, and a channel provider. This information can vary depending on a version of the received ESG. The user can select the channel using the above information, and view the on-air program (content) of the selected channel.

[0136] In the UI construction for the channel selection using the service of the digital broadcasting receiver (service of DVB-H player application), there are provided two options. One of them is an option in the channel selection, and the other is an option of a broadcasting start screen. The former option in the channel selection has "Searching channel" for listing information of the broadcasting channels (services) transmitted through the broadcasting steam, so that the user can view the listed information, and has a function of allowing the user to view "Event Information" being a broadcasting time table of the traditional TV in the selected channel. The latter option of the broadcasting start screen provides a function of changing various settings relating to the program (content) under view or displaying detailed information on the program. "Capture Video Frame" performs a function of capturing a currently displayed screen and storing the captured screen as an image file, "Video Preference" and "Audio Preference" perform a function of changing a basic setting for audio/video, and "Content Information View" performs a function of displaying the detailed information on the program under view.

[0137] As another method for the channel selection shown as in 1.2 of **FIG. 15**, there is a method using an event list including time-based scheduling information of the program (content). The program (content) refers to the traditional TV program, and the event list can include schedule information on other type content, not the TV program. The content can be another ESG, Java Applet, and WAP page, and is operated in determined schedule information. Accordingly, in selection of the content based on the method using the event list, an option of a content start screen should be different from that of the broadcasting start screen using the service information. In other words, the "Capture Video Frame", the "Video Preferences", and the "Audio Preferences" should be changed into "Content Preferences". The "Content Preferences" has an option specialized to a corresponding content, and the specialized option is decided depending on a content type. For example, when the content type is the A/V (broadcasting program), an option such as 1.1.1 will be applied, and when the content type is the Java Applet, an option for execution and end of the Java Applet will be applied. Even in other content types, a necessary option can be supported depending on the respective content types.

[0138] Hereinafter, a procedure for, in the DVB_H digital broadcasting receiver, receiving the ESG data packet stream, processing an IP header, editing the broadcasting program data included in the ESG data into the program of the service channel, and displaying the edited program data will be described in detail.

[0139] An operation of the IP decapsulator **550** of **FIG. 13** will be described. **FIG. 16A** exemplifies a stream construction of the IP datagram, **FIG. 16B** illustrates a structure of the service data packet stream in the IP datagram, and **FIG. 16C** illustrates a structure of the ESG data packet stream in the IP datagram. In the structure of the ESG data packet stream shown in **FIG. 16C**, a FLUTE header includes an asynchronous layered coding/layered coding transport (ALC/LCT) building block header, and the payload can be XML-structure FDT or real data. Accordingly, the ESG data are stored in the payload region.

[0140] Therefore, the IP decapculator **550** receiving the above IP datagram receives the IP datagram shown in **FIG. 16A**. The service data packet stream of **FIG. 16B** with the IP header eliminated is transmitted to the demultiplexer (TS demux) **210** and, the ESG data packet stream of **FIG. 16C** with the IP header eliminated is transmitted to the controller **100**.

[0141] A procedure of eliminating the IP information in the IP decapsulator **210** will be described. The IP decapsulator **550** confirms a version of the received IP datagram, and confirms whether a current protocol includes a User Datagram Protocol (UDP) or a Transmission Control Protocol/Internet Protocol (TCP/IP). If the current protocol does not include the UDP or the TCP/IP, the IP datagram is not a desired datagram and therefore, is not processed. Otherwise, the payloads are extracted from the IP datagram, and a datagram is again created. If the UPD header is eliminated, a desired Real Time transport Protocol (RTP) or the MPEG-2 TS data is extracted.

[0142] The IP datagram outputted from the demodulator **120** is inputted in a format of **FIG. 16A**, and the IP datagrams can have the structures of **FIGS. 16B** or **16C**, respectively. Accordingly, upon receipt of the IP datagram, the IP decapsulator **550** analyzes the IP header, and confirms the IP version and the used protocol. The IP version can be an IP version 6 and an IP version 4. After that, in the IP version 6, the IP decapculator **210** parses a header of the IP version 6 and searches for the protocol, and in the IP version 4, the IP decapsulator **210** parses a header of the IP version 4 and searches for the protocol. The protocol can employ the UDP and the TCP/IP. Accordingly, after the confirming of the protocol, the IP decapsulator **550** confirms a field of the IP header and acquires a payload length. Next, after extracting of the payload datagram, the IP decapsulator **550** eliminates the UDP or TCP/IP header, and extracts the TS stream.

[0143] In an embodiment of the present invention, it is assumed that, as described above, the ESG data packet stream is processed in software. Accordingly, the IP decapsulator **550** transmits the ESG data packet stream to the controller **100**. In the service data packet stream, the IP decapsulator **501** transmits a RTP header to the controller **100**, and transmits the payload portion to the demultiplexer **210**. The payload information transmitted to the demultiplexer **210** can be a packet stream having the MPEG-2 TS structure.

[0144] **FIG. 17** is a flowchart illustrating a procedure of acquiring the FLUTE payload in the ESG data packet stream of **FIG. 16C**. In the present invention, it is assumed that, as described above, editing of the ESG data and the FLUTE header of the ESG data packet stream is processed in the controller **100**. The processing of the ESG data packet stream of the controller **100** is performed in the PSD/SI decoder & controller of **FIGS. 14A** or **14**B. In other words, the PSI/SI decoder of the controller **100** decodes the ESG data packet stream. The PSI/SI decoder can be provided in hardware or software like the audio/video decoder.

[0145] Referring to **FIG. 17**, the ESG data is acquired through the FLUTE payload.

[0146] The controller **100** performs a session initialization operation in Step **601**. After that, if the IP decapsulator **550** receives the ALC/LCT building block of the FLUTE header, the controller **100** processes the ALC/LCT building block received in Step **603**. An ALC header of the ALC/LCT building block is provided to have a construction of **FIG. 18A**. In the ALC header, a LCT header being a second field is provided to have a construction of **FIG. 18B**. All determination processes of **FIG. 17** are made through a value set to the LCT header of **FIG. 18B**. In a description of a construction of the LCT header of **FIG. 18B**, a RFC3451 being a definition of each value of the header is confirmed.

[0147] In Step **603**, the controller **100** processes the ALC/LCT building block with reference to the LCT header having the construction of **FIG. 18B** in the ALC header of **FIG. 18A**. In Step **621**, the controller **100** checks whether or not the ALC/LCT building block is a File Delivery Table (FDT). If the ALC/LCT building block is the FDT, in Step **623**, the controller **623** parses the FDT and otherwise, in Step **625**, the controller **623** saves the processed block. The controller **100** determines whether the ALC/LCT building block is the FDT with reference to a Transport Object Identifier (TOI) field that is a fourth layer of the LCT header having the construction of **FIG. 18B**. When the TOI field has a value of zero, the controller **100** determines that the ALC/LCT building block is the FDT. The FDT includes individual information on transmitted files, and the individual information includes a file name, a path, and a fie type. After processing of the ALC/LCT building block in Step **605**, the controller **100** checks whether an error occurs. Upon occurrence of the error, in Step **607**, the controller **100** error-processes the ALC/LCT building block. However, if it is determined to be normal in Step **605**, in Step **609**, the controller **100** checks whether to receive all ALC/LCT building blocks and otherwise, in Step **611**, the controller **100** waits for receipt of a next block. If the above steps are repeated and all ALC/LCT building blocks are received, in Step **609**, the controller **100** detects the receipt of the blocks, aligns the processed blocks and then, in Step **615**, integrates the aligned blocks.

[0148] As described above, the controller **100** acquires the ESG data from the ESG data packet stream. After that, the controller **100** can display data of such as the broadcasting program using the acquired ESG data.

[0149] **FIG. 19** illustrates an ESG structure. Referring to **FIG. 19**, the ESG includes seven fragments. The fragments have a mutual linkage relationship, and have a structure capable of referring to data. One schedule event **750** indicates one service **740**, and a list of an acquisition **770** and a list of content **760** for the one service. One service indicates a list of the acquisition **770** corresponding to the service. One content **760** indicates a list of the self-belonging service **740**. One service bundle **710** indicates a list of the service **740**, and one purchase **720** indicates a list of one service bundle **710** and purchase channel **730**. Accordingly, as shown in **FIG. 19**, the respective fragments **710** to **770** have

the mutual linkage relationship. Table 10 below illustrates an example of the contents fragment **760** of the ESG having the structure of **FIG. 19**.

TABLE 10

```
<ContentDescription contentDescriptionID="101">
    <BasicDescription>
        <Title type="main" xml:lang="en-us">ZDF</Title>
            <Media Title>
                <mpeg7:TitleImage>
                    <mpeg7:MediaUri>ZDF.JPG</mpeg7:MediaUri>
                </mpeg7:TitleImage>
            <Media Title>
            <Synopsis xml:lang="en-us">ZDF music video</Synopsis>
            <Genre type="main" href=Text">
                <tva:Name
                xml:lang="en-us">Entertainment</tva:Name>
                <tva:Definition xml:lang="en-us">music
                video</tva:Definition>
            </Genre>
            <Duration>P1Y2M3DT10H30MOS</Duration>
    </BasicDescription>
</ContentDescription>
```

[**0150**] A content of the Table 10 has an ID of **101**, a title of ZDF, and a title image of ZDF.JPG. It can be appreciated that a content summary is a ZDF music video, and a genre is a music video in entertainment. It can be appreciated from "P1Y2M3DT10H20Mos" that the music video of the Table 10 has a viewing time limit of one year, two months, three days, 10 hours, and 30 minutes. For viewing the above broadcasting, the service **740** and the schedule event **750** including the content should be searched through the ID, and the acquisition **770** should be acquired from the searched service **740** or the schedule event **750**.

[**0151**] **FIG. 20** illustrates a procedure of extracting and structuring the ESG data from the ESG data packet stream and editing and structuring the ESG data in a format of the EPG data according to an embodiment of the present invention.

[**0152**] Referring to **FIG. 20**, first, when ESG initialization request is made, in Step **811**, the controller **100** detects the request, and in Step **813**, the controller **100** performs an IP decapsulating operation for extracting FLUTE data from the ESG data packet stream. The ESG initialization is generated when the user requests for the ESG initialization or the ESG data should be updated. After the IP decapsulation is performed, in Step **815**, the controller **100** parses the FLUTE protocol and stores the payload data. The stored data can include the XML-formatted ESG data. After that, in Step **817**, the controller **100** parses the XML-formatted ESG data, and generates and stores the structured ESG data (information) in the memory **180**. The structured ESG data is data for displaying as the channel information when there occurs a user channel information request. In an embodiment of the present invention, together with the structured ESG data, it is structured and stored as EPG type channel display information including only the program information of the respective service channel. In other words, the ESG data is structured and stored as the EPG data.

[**0153**] **FIG. 21** illustrates a structure of the XML-formatted inputted ESG data parsed and stored in the memory **180**.

[**0154**] Referring to **FIG. 21**, the ESG data in which, as shown in **FIG. 19**, a total of seven ESG fragments form a structure of linked lists depending on respective types, is stored in the memory **180**. The memory **180** stores the ESG data in a heap memory. The heap memory refers to a memory space that can be assigned and used at a dynamic time and be released in its assignment at a predetermined time point. The header being an uppermost structure of each fragment is accessible to a whole area within an ESG module, and necessary information is obtained by having access to each fragment header through an ESG module API according to need.

[**0155**] For example, describing a procedure of confirming a field value "ServiceNumber" of a service **2**, a series of procedure of a first process of acquiring a pointer (memory address) of a service fragment header being the whole area, using the ESG API, a second process of acquiring a pointer of a service fragment (service **2**) subsequently connected from the acquired pointer using the ESG API, and a third process of acquiring the value of "ServiceNumber" from the contents of the acquired pointer. In each fragment, information of the field intending to be acquired from the fragment can be acquired through the above series of the procedure.

[**0156**] The ESG is structured so that the ESG information can be stored in the memory to have the above data structure and easily transmitted to a module needing the ESG information.

[**0157**] If the above procedure is performed, the memory **180** stores the structured ESG data and the EPG data. In the above state, if the user requests the channel information, the controller **100** has access to the structured ESG or EPG data in the memory **180** and displays the access data on the display unit **150**. The user can select a function of displaying the ESG formatted channel information and also, can select a function of selecting the EPG formatted channel information. The selection of the channel information displaying function can be performed in several methods. In an embodiment of the present invention, a channel information view menu can display ESG and EPG display menus, and can display the channel information of a display menu based on the user's selection. In other words, as described above, the structured ESG data can be displayed as the channel information and also, the ESG data can be edited and displayed on a service-by-service basis and on a content-by-content basis (program and event).

[**0158**] In a description of a method for displaying the ESG data, fit, in the ESG data structured as shown in **FIG. 21**, the controller **100** acquires a schedule event list and a service list, and acquires content information through the selected service ID.

[**0159**] If the user selects the channel, in Steps **833** and **835** (**FIG. 20**), the controller **100** processes and displays the data of the selected broadcasting channel. In other words, the controller **100** controls the tuner **110** and the demodulator **120** to select the user's setting channel, and demodulate the received broadcasting signal, thereby generating the IP datagram. The IP datagram outputted from the demodulator **120** can be the service data packet stream of **FIG. 4B**. Then, the data processor **130** decapsulates the IP information in the received IP datagram, and the demultiplexer demultiplexes the packets constituting the payload and generates a video ES and/or an audio ES. The video decoder decodes the video ES, and outputs the video data to the display unit **150**. The audio decoder decodes the audio ES, and outputs the audio data to the speaker **160**.

[0160] Table 11 below illustrates an example of the structured ESG data.

TABLE 11

```
<?xml version="1.0" encoding="US-ASCII"?>
<ESGDescription>
    <ContentInformation Table>
①       <ContentDescription contentDescriptionID="101">
            <BasicDescription>
②               <Title type="main"xml:lang="en-uk">"Al-Qaeda' claims Jordan attacks</Title>
                <Media Title>
                <mpeg7:TitleImage>
                    <mpeg7:MediaUri>
                        http://newsimg.bbc.co.uk/media/images/41003000/jpg/__41003044__ap203bodyhelp.jpg
                        </mpeg7:TitleImage>
                </Media Title>
③               <Synopsis xml:lang="en-uk">
                Al-Queda in Iraq has claimed it carried out the bomb attacks which killed at least 57 people in
three hotels in Jordan's capital Amman.
                </Symopsis>
④               <Genre type="main" href=http://news.bbc.co.uk>
                    <tva:Name xml:lang="en-uk">News</tva:Name>
                    <tva:Definition xml:lang="en-uk">bbc Middle east news uk edition</tva:Definition>
                </Genre>
⑤               <Duration>P0Y0M0DT00H30M0S</Duration>
            <BasicDescription>
        </ContentDescription>
----------------------------------------cf1
        <ContentDescription contentDescriptionID="102">
            <BasicDescription>
            <Title type="main" xml:lang="en-uk">Violence subsides across France</Title>
                <Media Title>
                    <mpeg7:TitleImage>
                        <mpeg7:MediaUri>file://__41002586__gendarme203ap.jpg</mpeg7:MediaUri>
                    </mpeg7:TitleImage>
                </Media Title>
            <Synopsis xml:lang="en-uk">
                Urban violence has subsided for a third night in France, with fewer cars set ablaze and
curfews in force in just five administrative areas.
                </Synopsis>
                <Genre type="main">
                    <tva:Name xml:lang="en-uk">News</tva:Name>
                    <tva:Definition xml:lang="en-uk">bbc Europe uk edition</tva:Definition>
                <Genre>
⑥               <ParentalGuidance>
                        <mpeg7:MinimumAge>14</mpeg7:MinimumAge>
                <ParentalGuidance>
                <Duration>P0Y0M0DT00H30M0S </Duration>
                </BasicDescription>
        </ContentDescription>
        ----------------------------------------cf2
    <ContentDescription contentDescriptionID="103">
            <BasicDescription>
            <Title type="main"xml:lang="en-uk">Blair meets Cabinet after defeat</Title>
                <Media Title>
                <mpeg7:TitleImage>
                    <mpeg7:MediaUri>
                    http://newsimg.bbc.co.uk/media/images/410020000/jpg/__41002996__blairpa203main.jpg
                    </mpeg7:MediaUri>
                </mpeg7:TitleImage>
            </Media Title>
        <Synopsis xml:lang="en-uk">
            Tony Blair is meeting his Cabinet as he tries to draw a line under his first Commons defeat as
prime minister.
                </Synopsis>
                <Genre type="main">
                    <tva:Name xml:lang="en-uk">News</tva:Name>
                    <tva:Definition xml:lang"en-uk">bbc politics news uk edition</tva:Definition>
                </Genre>
                <Duration>P0Y0M0DT00H30M0S </Duration>
            </Basic Description>
        </ContentDescription>
    </ContentInformation Table>
    ----------------------------------------cf3
    <Schedule>
        <ScheduleEvent freeToAir="true">
```

TABLE 11-continued

```
⑦                <Program>101</Program>
⑧                <PublishedStartTime>2005-11-11T09:30:00.0Z</PublishedStartTime>
                 <PublishedEndTime>2005-11-11T10:00:00.0Z</PublishedEndTime>
                 <ServiceRefIDRef="1"/>
                 <ContentRefIDRef="101"/>
                 <AcquisitionRefIDRef="201"/>
          </ScheduleEvent>
          <ScheduleEvent freeToAir="true">
          <Program>102</Program>
                 <PublishedStartTime>2005-11-11T10:00:000Z</PublishedStartTime>
                 <PublishedEndTime>2005-11-11T10:30:000Z</PublishedEndTime>
                 <ServiceRefIDRef="1"/>
                 <ContentRefIDRef="102"/>
                 <AcquisitionRefIDRef="202"/>
          </ScheduleEvent>
          <ScheduleEvent freeToAir="true">
          <Program>103</Program>
                 <PublishedStartTime>2005-11-11T10:30:000Z</PublishedStartTime>
                 <PublishedEndTime>2005-11-11T11:00:000Z</PublishedEndTime>
                 <ServiceRefIDRef="1"/>
                 <ContentRefIDRef="103"/>
                 <AcquisitionRefIDRef="203"/>
          </ScheduleEvent>
-----------------------------------------sef
     <ServiceInformation Table>
⑨                <ServiceInformation serviceDescriptionID="1">
⑩                    <Name xml:lang="en-uk">BBC News</Name>
                 <Logo>
                     <mpeg7:TitleImage>
                         <mpeg7:MediaUri>file://bbc__news.jpg</mpeg7:MediaUri>
                     </mpeg7:TitleImage>
                 </Logo>
                 <ServiceDescription xml:lang="en-uk">BBC news uk edition</ServiceDescription>
⑪                <ServiceGenre type="main">
                     <tva:Name xml:lang="en-uk">News</tva:Name>
                     <tva:Definition xml:lang="en-uk">BBC news uk edition</tva:Definition>
                 </ServiceGenre>
⑫                <Language>en-uk</Language>
                 <ServiceProviderName xml:lang="en-uk">BBC</ServiceProviderName>
                 <ServiceProviderURI>http://news.bbc.co.uk</ServiceProviderURI>
                 <AcquisitionRefIDRef="201"/>
                 <ContentRefIDRef="101"/>
                 <AcquisitionRefIDRef="202"/>
                 <ContentRefIDRef="102"/>
                 <AcquisitionRefIDRef="203"/>
                 <ContentRefIDRef="103"/>
             </ServiceInformation>
          </ServiceInformation Table>
-----------------------------------------sif
          <AcquisitionInformation Table>
              <AcquisitionInformation acquisitionInformationID="201">
                  <ContentReferenceInformation>101</ContentReferenceInformation>
                  <Zapping Type>
                      <Video>true</Video>
                      <Audio>true</Audio>
                      <Stillpic>false</Stillpic>
                      <Text>false</Text>
⑬                    <SDPref>4601.sdp</SDPref>
                  </Zapping Type>
              </AcquisitionInformation>
              <AcquisitionInformation acquisitionInformationID="202">
                  <ContentReferenceInformation>102</ContentReferenceInformation>
                  <Zapping Type>
                      <Video>true</Video>
                      <Audio>true</Audio>
                      <Stillpic>false</Stillpic>
                      <Text>false</Text>
                      <SDPref>4633.sdp</SDPref>
                  </Zapping Type>
              <AcquisitionInformation>
              <AcquisitionInformation acquisitionInformationID="203">
                  <ContentReferenceInformation>103</ContentReferenceInformation>
                  <Zapping Type>
                      <Video>true</Video>
                      <Audio>true</Audio>
```

TABLE 11-continued

```
                    <Stillpic>false</Stillpic>
                    <Text>false</Text>
                    <SDPref>4649.sdp</SDPref>
                </Zapping Type>
            </AcquisitionInformation>
        </AcquisitionInformation Table>
----------aif
</ESGDescription>
```

[0161] In the present invention, there is provided a method for matching and structuring the ESG data having the structure of the Table 11 to and into the EPG data format, and upon request for displaying the channel information, displaying the structured EPG formatted data. The structured EPG data refers to EPG data obtained by summarizing information on the service-by-service basis and information on the content-by-content (program and event) basis as shown in **FIGS. 11A and 11B**.

[0162] The ESG data of the Table 11 has the structure of a dynamic steam. The dynamic stream refers to a stream received irrespective of a sequence of the service channels and contents. In other words, the dynamic stream refers to a stream received with the contents of several service channels mixed in a broadcasting time sequence. Accordingly, when the channel information of the ESG data is displayed, the contents of several service channels are mixed and displayed in the broadcasting time sequence. To the contrary, the EPG data is a static stream. The static stream refers to a stream received with the contents of the same service channel based on the broadcasting time sequence. As described above, the viewer is familiar with the displaying of the EPG formatted channel information, and this can be also preferred. Accordingly, it is desirable that, together with a method for displaying the ESG formatted channel information, a method for converting the ESG data into the EPG data format and displaying the converted EPG data is used.

[0163] For this, the ESG data having the structure of the Table 11 can be converted into the EPG data format, and upon user's request for displaying the channel information, the ESG data or the EPG data can be selectively displayed. In a detailed description of the structure of the Table 11, "cf" denotes a contents fragment, "sef" denotes a schedule event fragment, "sig" denotes a service information fragment, and "aif" denotes an acquisition information fragment. Accordingly, Table 11 illustrates an example of sequentially receiving three fragments (cf1 to cf3), and respective ones of the schedule event fragment (sef), the service information fragment (sif), and the acquisition information fragment (aif).

[0164] In a description of a construction of the contents fragment, the contents fragment includes information on a content description ID and a basic description. The content description ID is information for identifying the service channel, and represents a first content of a broadcasting channel 1. The basic description information includes information such as a title type (title type), a media title (media title), a title synopsis (synopsis), a content genre type (genre type), view guidance (parental guidance), and a broadcasting time (duration). In the Table 11, the contents fragments (cf1 to cf3) are denoted by "101" to "103". Accordingly, it can be appreciated that the contents fragments (cf1 to cf3) are all contents fragments of the same service. However, in the contents fragments, contents of other services can be arranged in a time sequence.

[0165] First, the title type is a title of a corresponding content, and includes information on a used language and the title of the corresponding content. The title media displays multimedia data information on the title of the content. The title media can have a coding type and a storage position of the multimedia data (ur1 information on a location of the multimedia data as in the cf1 or information of the multimedia data actually received as in the cf2). The title synopsis has data obtained by synopsizing the content of the corresponding title. The title genre is a kind of the corresponding title, and exemplifies a case where the title genre is news in the cf1 to cf3. The view guidance is to guide the corresponding title for the viewable age, and a viewable age of the cf2 is exemplified as a minimum age of 14. The broadcasting time refers to a time for which the corresponding content of the title is broadcasted.

[0166] Second, in a description of constructions of the schedule event fragment, the schedule event fragment is a fragment including schedule event information of the contents fragments. The schedule event fragment includes names or content IDs of the respective contents fragments, broadcasting start and end times of the content, a service ID, a content ID, and a corresponding content acquisition ID. For example, in a description of a schedule event of the contents fragment (cf1), first, a content matched with the content name or the content ID is "101", the broadcasting start time is 09:30, Nov. 11, 2005, the end time is 10:00, Nov. 11, 1005, the service channel is "1", the content ID is "101", a content "101" acquisition ID is "201". Even the schedule events of the contents fragments (cf2 and cf3) are defined in the schedule event fragment in the above method.

[0167] Third, in a description of a construction of the service information fragment, the service information fragment includes a broadcasting channel, a channel name, a title logo image, a service genre type, a service language, service language and URI information, content description IDs, and acquisition ID information corresponding thereto. In a description of a construction of the service information fragment included in the Table 1, the broadcasting channel served is "1", the channel name is "BBC news", the title logo image is "bbc_news.jpg", the service genre is "news", the provided language is "United Kingdom (UK)", the UIR is "http//news.bbc.co.uk", a content ID of an acquisition ID "201" is "101", a content ID of an acquisition ID "202" is "102", and a content ID of an acquisition ID "203" is "103".

[0168] Fourth, in a description of a construction of the acquisition information fragment, the acquisition information fragment includes information on the acquisition ID and

the content ID of the contents (cf1 to cf3), multimedia data structure of the content, and a content data storage position. In a description of the acquisition information of the fragment (cf1), the acquisition ID is "201", the content ID is "101", a constructed multimedia type (zapping type) includes video and audio data, a still picture and a text are not provided, and a storage position of actual data (audio and video file) of the content "101" is "4601.sdp (session description protocol)". Even remaining contents fragments (cf2 and cf3) have acquisition information in the above structure.

[0169] Accordingly, where the ESG data block of the Table 11 is matched to the EPG data format, it can be displayed as in Table 12 below. In other words, as shown in the Table 12 below, the content IDs "101", "102", and "103" are all included in "service information 1". It can be appreciated that "ScheduleEvent" and "AcquisitionInformation" are matched to corresponding content IDs, respectively.

TABLE 12

ScheduleEvent 101	SeviceInformation 1	ContentDescription 101	AcquisitionInformation 201
ScheduleEvent 102		ContentDescription 102	AcquisitionInformation 202
ScheduleEvent 103		ContentDescription 103	AcquisitionInformation 203

[0170] Accordingly, the ESG data having the format of the Table 11 can be linked with the EPG format of **FIGS. 11A and 11B**. **FIG. 22** illustrates a result obtained by linking and matching the ESG data with the EPG data format. As shown in **FIG. 22**, the ESG data is a user guide of more advanced concept than that of the EPG data and therefore, the link with the EPG data format can be easily converted from the ESG information as in **FIG. 22** through a preprocessing process.

[0171] Referring to **FIG. 22**, in a method for displaying the EPG data according to the present invention, there is provided the structures of **FIGS. 11A and 11B**. When the channel information of the ESG data is displayed, the ESG data is displayed even in the EPG displaying method besides an inherent ESG data displaying function. For this, the ESG data having the structure of the Table 11 is converted into the channel information of the EPG structures of **FIGS. 11A and 11B**. **FIG. 22** is a matching table for displaying the ESG data in the EPG format.

[0172] First, an operation of matching the ESG data to the EPG format of **FIG. 11A** will be described. The EPG format of **FIG. 11A** has field information obtained by summarizing the information of the respective service channels. The country code is matched with a language field of the service information fragment of the ESG data. The language field of the service information fragment shows a language and a country of a corresponding service (e.g. en:uk (English:the United Kingdom)). Transport stream id (transport_stream_id), network id (original_network_id), and regional information (terrestrial delivery system) fields of the EPG format are matched with a SDP field of the acquisition information fragment of the ESG data. The service ID (service_id) and the channel number (logical_channel_number) of the EPG format are matched with a service ID field of the service information fragment. The service type (service_type) of the EPG format is matched with the genre type (genre field) of the contents fragment of the ESG data. The service channel name (service_name_char) of the EPG format is matched with a service name field of the service information fragment of the ESG data. As described above, when the ESG data is matched to the EPG format, in the information summary of the service channels, the channel names and numbers and the genres of the respective services of the ESG data are summarized and displayed in the EPG format of **FIG. 11A**.

[0173] Second, an operation of matching the ESG data to the EPG format of **FIG. 11B** will be described. In the structure of **FIG. 11B**, the program information of the respective service channels is displayed. First, the event ID (event_id) of the EPG format is matched with a content ID field of the contents fragment of the ESG data (or the program ID of the schedule event fragment). The broadcasting start time (start_time) of the EPG format is matched with the broadcasting start time of the schedule event fragment of the ESG data. The broadcasting time (duration) of the EPG format is matched with the broadcasting time of the contents fragment of the ESG data. The event name (event_name_length) and the event name (event_name_char) of the EPG format are matched with a title type field of the contents fragment of the ESG data. A content level (content_level) of the EPG format is matched with a genre type field of the contents fragment of the ESG data. A rating field of the EPG format is matched with a parent guide field of the contents fragment of the ESG data. The program summary (text_char_length and text_char) of the EPG format is matched with a synopsis field of the contents fragment of the ESG data. As described above, when the ESG data is matched to the EPG format, in the EPG format of **FIG. 11B**, the program information summary of the respective service channels can summarize and display the start time, broadcasting time, title name, genre, viewable age guide, and title summary information of the programs of the service channel corresponding to the content and the schedule event fragments of the ESG data. The above construction is generated on a per-title basis.

[0174] **FIG. 23** is a flowchart illustrating a preprocessing process for converting the ESG data of **FIG. 22** into the EPG data format. Referring to **FIG. 23**, first, in Step **911**, the controller **100** confirms number of services in the ESG data having the structure of the Table 11 and then, sets the service number to a variable "N". After that, in Step **913**, the controller **100** confirms an ESG field based on the EGP field from predefined matching information as in **FIG. 22**. In Step **915**, the controller **100** checks whether or not there is a value in a corresponding ESG field. If there is the value in the ESG field, in Step **917**, the controller **100** matches corresponding fields of the ESG data to the predefined matching field. In other words, the ESG data having the structure of the Table 11 is matched to the EPG data format having the structures of **FIGS. 11A and 11B** with the pattern of **FIG. 22**. The above operation is repeatedly performed while the respective contents of the service channel are converted into the EPG format.

[0175] If the operation of **FIG. 23** is performed, the ESG data of the Table 11 is converted into the channel information of the EPG format as in Table 13 below.

TABLE 13

EPG/ESG data link format	
EPG	ESG
Service Layer	
Current time (4*8bits)	
Local_time_offset (3*8bits)	
Country code	"en-uk"
Transport_stream_id	"4601.sdp/4633.sdp/4649.sdp"
Original_network_id	
Terrestrial delivery system	
Service_id	"1"
Logical_channel_number	"1"
Service_type	"News/BBC news uk edition"
Service_name_char	"BBC News"
	. . . .other service
Event layer	
Event_id	101
Start_time	2005-11-11T09:30:00.0Z
duration	P0Y0M0DT00H30M0
Event_name_length	Length of "Al-Queda'claims Jordan attacks"
Event_name_char	"Al-Qaeda'claims Jordan attacks"
Text_char_length	Length of "Al-Qaeda in Iraq has claimed it carried out the bomb attacks which killed at least 57 people in three hotels in Jordan's capital Amman."
Event_id	102
Start_time	2005-11-11T10:00:00.0Z
Duration	P0Y0M0DT00H30M0
Event_name_length	Length of "violence subsides across France"
Event_name_char	"Violence subsides across France"
Content_level	"News/bbc Europe uk edition"
Rating	"MinimumAge: 14"
Text_char_length	Length of "Urban violence has subsided for a third night in France, with fewer cars set ablaze and curfews in force in just five administrative areas."
Text_char	"Urban violence has subsided for a third night in France, with fewer cars set ablaze and curfews in force in just five administrative areas."
Event_id	103
Start_time	2005-11-11T10:30:00.0Z
Duration	P0Y0M0DT00H30M0
Event_name_length	Length of "Blair meets Cabinet after defeat"
Event_name_char	"Blair meets Cabinet after defeat"
Content_level	"News/bbc politics news uk edition"
Rating	
Text_char_length	Length of "Tony Blair is meeting his Cabinet as he tries to draw a line under his first commons defeat as prime minister."
Text_char	"Tony Blair is meeting his Cabinet as he tries to draw a line under his first commons defeat as prime minister."
	. . . ..other event

[0176] Accordingly, upon occurrence of the initialization request for the ESG data in the Step **811** of **FIG. 20**, in the Step **817**, the structured ESG data of the Table 11 is generated and at the same time, in the Step **819**, the structured EPG data obtained by matching the ESG data to the EPG format having the construction of **FIG. 22** is generated and stored in the memory **180**. After that, upon user's request for the channel information, the controller **100** can select the structured ESG data or EPG data in the memory **180** by user's selection and can display the selected ESG data or EPG data on the display unit **150**. Accordingly, in the apparatus having the DVB_H type digital broadcasting receiver, when the channel information is displayed, the structured ESG data can be used to display the ESG data arranged depending on the broadcasting time of the contents, and the contents to be broadcasted at a specific service channel can be displayed on the broadcasting time-by-broadcasting time basis.

[0177] As described above, in the digital broadcasting receiver using the ESG data as channel information display data, when the channel information is displayed, it can be displayed as the structured ESG data and the structured EPG data. In other words, where the user confirms the information of the channels broadcasted in the digital broadcasting receiver, he/she needs a function of displaying the service channels and the programs broadcasted in the corresponding service channel. This is because, in the ESG data, when the broadcasted channel information is displayed, the information of the programs broadcasted over the respective service channels is displayed on the broadcasting time-by-broadcasting time basis and therefore, the broadcasting programs of several service channels are together displayed. Accordingly, it is desirable to add a function of displaying the channel information of the digital broadcasting receiver in the EPG format.

[0178] The ESG data has the IP-based data structure. Accordingly, the broadcasting receiver and the data processor **130** should have a structure for processing the IP information. For this, the broadcasting receiver including the tuner **110** and the demodulator **120**, receives and demodulates the digital broadcasting signal of the selected channel, confirms the PID of the demodulated data, and outputs the IP datagram data having the PID of the set channel. Then, the data processor **130**, which includes the IP decapsulator **550**, the demultiplexer **210**, the video decoder **230**, and the audio decoder **250**, decapsulates IP data of IP datagram data, separates the service data packet stream or the ESG data packet stream, and demultiplexes and decodes the service data packet stream into the audio and video data. The decoded audio and video data is played through the speaker **160** and the display unit **150**, respectively.

[0179] The controller **100** controls the broadcasting receiver to receive the digital broadcasting signal of the broadcasting channel set by the user. The controller **100** parses the ESG data packet stream outputted from the data processor **130**, and generates and stores the structured ESG data in the memory **180**. The controller **100** analyzes the structured ESG data, generates the summary information on a service channel-by-service channel basis, generates the summary information of the programs of the respective service channels, and generates and stores the structured EPG data in the memory **180**. After that, upon user's request for displaying the channel information, the controller **100** controls an operation for displaying the ESG data or the structured ESG data selected by the user's selection on the display unit **150**.

[0180] Upon receipt of the ESG data packet stream, the controller **100** generating the structured EPG data parses the

ESG data, generates and stores the structured ESG data in the memory **180**, combines the channel information data of the acquisition fragment and the service information fragment of the structured ESG data, generates the summary information of the programs of the respective service channels, generates the structured first EPG data, combines the channel information data of the schedule event fragments and the contents fragments, and generates and stores the structured second EPG data in the memory **180** as the structured EPG data.

[**0181**] The controller **100** matches the service identification field and the name and genre fields of the service information fragment and the acquisition fragment of the structured ESG data, to the service channel name, category, and language, respectively, and generates the first EPG data. The controller **100** matches the broadcasting start time field of the schedule event fragment of the structured ESG data and the broadcasting field, the title field, and the genre and synopsis fields of the content fragment, to the event start time, the event broadcasting time, the event name, the event category, and the event summary of the event information, respectively, and generates the structured second EPG data. After that, the controller **100** stores the generated first and second EPG data in the memory **150** as the structured EPG data.

[**0182**] The first EPG data is generated as the structured EPG data by matching the SDP field of the acquisition information fragment of the structured ESG data to the network layer of the first EPG data, and matching the service ID field, the service genre field, and the service name field of the service information fragment to the corresponding service channel number, service type, and service channel name of the service layer of the first EPG data, respectively. The second EPG data is generated as the structured second EPG data by matching the content identification field and the broadcasting start time field of the schedule event fragment of the structured ESG data to the event identification and the start time of the second EPG data, respectively, and matching the broadcasting time field, the title field, the genre field, and the synopsis field of the contents fragment to the broadcasting time, the event name, the content level, and the event summary of the second EPG data, respectively.

[**0183**] After the storing of the above structured ESG data and EPG data in the memory **180**, upon the user's request for displaying of the channel information, the controller **100** controls an operation for displaying the structured ESG and structured EPG data, having access to the structured ESG or EPG data selected by the user in the memory, and displaying the structured ESG or EPG data on the display unit **150**. Where the user requests displaying of the structured EPG data, the controller **100** has access to the first EPG data in the memory **180**, and displays the first EPG data on the display unit **150**. After that, if the user sees the summary information of the specific service channels displayed on the display unit **150** and requests displaying of the channel information of the specific service channel, the controller **100** has access to the second EPG data of the corresponding service channel in the memory **180** and displays the second EPG data on the display unit **150**. As described above, if the user requests displaying of the channel information of the structured EPG data, first, the controller **100** displays the summary information for displaying the names of all service channels of the digital broadcasting receiver. If the user requests displaying of the channel information of the specific service channel while displaying the information of the service channels, the controller **100** can display the programs broadcasted over the corresponding channel on the display unit **150** in the broadcasting time sequence.

[**0184**] The digital broadcasting receiver for displaying the ESG and structured EPG data as the channel information can be installed at the wireless terminal.

[**0185**] As described above, the wireless terminal having the digital broadcasting receiver can embody the user interfaces for selecting the digital broadcasting channel, changing the audio and video display state of the selected channel, and displaying the program information of the broadcasting channel. Accordingly, there is an advantage of selecting the inputted digital broadcasting channel on the display unit of the wireless terminal, and displaying audio and video display states of the selected channel, and the program information of the respective service channels depending on the user's selection.

[**0186**] While the present invention has been described and illustrated herein with reference to the preferred embodiments thereof, it will be apparent to those skilled in the art that various modifications and variations can be made therein without departing from the spirit and scope of the invention. Therefore, the scope of the present invention includes the modifications and variations that shall be determined by the appended claims and their equivalents rather than by the embodiments described above.

1. An apparatus for displaying channel information in a digital broadcasting receiver, the apparatus comprising:

a broadcasting receiver for receiving and demodulating a digital broadcasting signal of a selected channel;

a data processor for demultiplexing the demodulated broadcasting signal, separating Electronic Program Guide) (EPG) data and broadcasting data, and decoding the broadcasting data;

a controller for controlling an operation for analyzing the EPG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, generating structured EPG data, and, upon request for displaying channel information, displaying the EPG data or the structured EPG data by user selection;

a memory for storing the EPG data and the structured EPG data under control of the controller; and

a display unit for displaying the selected EPG data or structured EPG data as the channel information.

2. The apparatus of claim 1, wherein the structured EPG data comprises:

first EPG data provided corresponding to a number of the service channel, each having service channel information having service channel category and service channel name; and

second EPG data having event information broadcasted over the service channel and stored in a broadcasting time sequence, and the event information having a broadcasting start time, a broadcasting time, an event name, and an event summary of a corresponding event.

3. The apparatus of claim 2, wherein the first EPG data further comprises:

a network layer for storing a physical channel identification, broadcasting station information, and a plurality of numbers of the service channels using a physical channel; and

service layers provided corresponding to the number of service channel, each storing a service channel identification, a service channel number, a service category and a service channel name.

4. The apparatus of claim 2, wherein the second EPG data comprises event layers for each program provided for a corresponding service channel, the event layers provided in a number format corresponding to the respective service channels and each having the broadcasting start time, the broadcasting time, the event name, an event category, and the event summary.

5. The apparatus of claim 2, wherein, upon user request for channel information, the controller controls an operation for displaying the EPG data and the structured EPG data, having access to the EPG data or structured EPG data selected by a user in the memory, and displaying the EPG data or the structured EPG data on the display unit.

6. The apparatus of claim 5, wherein, upon user request for displaying the structured EPG data, the controller displays the first EPG data, and displays the second EPG data of the service channel based on the user selection.

7. The apparatus of claim 6, wherein the digital broadcasting receiver is a wireless terminal further comprising a wireless communication unit.

8. An apparatus for displaying channel information in a digital broadcasting receiver, the apparatus comprising:

a broadcasting receiver for receiving and demodulating a digital broadcasting signal of a selected channel, and outputting (Internet Protocol (IP) datagram data;

a data processor for decapsulating IP data of the IP datagram data, separating a service data packet stream or an Electronic Service Guide (ESG) data packet stream, and demultiplexing and decoding the service data packet stream into audio and video data;

a controller for controlling an operation for parsing the ESG data packet stream, generating structured ESG data, analyzing the structured ESG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, generating structured Electronic Program Guide (EPG) data, and, upon request for displaying the channel information, displaying the structured ESG data or the structured EPG data by user selection;

a memory for storing the structured ESG data and the structured EPG data by the controller; and

a display unit for displaying the selected structured ESG data or structured EPG data as the channel information.

9. The apparatus of claim 8, wherein, upon receipt of the ESG data packet stream, the controller parses the ESG data, generates and stores the structured ESG data in the memory, combines channel information data of a service information fragment and an acquisition fragment of the structured ESG data, generates the summary information of the programs of respective service channels, generates structured first EPG data, combines channel information data of contents fragments and schedule event fragments, and generates structured second EPG data.

10. The apparatus of claim 9, wherein the controller matches a service identification field, a name field, and a genre field of the service information fragment and the acquisition fragment of the structured ESG data to service channel name, category and language, respectively, to generate the first EPG data, and

wherein the controller matches a broadcasting start time field of the schedule event fragment of the structured ESG data and a broadcasting field, a title field, a genre field, and a synopsis field of the contents fragment to an event start time, an event broadcasting time, an event name, an event category, and an event summary of the event information to generate and store the structured second EPG data in the memory.

11. The apparatus of claim 10, wherein the controller matches a SDP (session description protocol) field of the acquisition information fragment of the structured ESG data to a network layer of the first EPG data, and matches a service identification field, a service genre field, and a service name field of the service information fragment to corresponding service channel number, service type, and service channel name of a service layer of the first EPG data, respectively, to generate the structured first EPG data.

12. The apparatus of claim 11, wherein the controller matches a content identification field and the broadcasting start time field of the schedule event fragment of the structured ESG data to event identification and start time of the second EPG data, respectively, and matches the broadcasting time field, the title field, the genre field, and the synopsis field of the contents fragment to a broadcasting time, an event name, a content level, and an event summary of the second EPG data, respectively, to generate the structured second EPG data.

13. The apparatus of claim 10, wherein, upon user request for the channel information, the controller controls an operation for displaying the structured ESG and structured EPG data, having access to the structured ESG or EPG data selected by a user in the memory, and displaying the structured ESG or EPG data on the display unit.

14. The apparatus of claim 13, wherein, upon user request for displaying the structured EPG data, the controller displays the first EPG data, and displays the second EPG data of the service channel based on user selection.

15. The apparatus of claim 14, wherein the digital broadcasting receiver is a wireless terminal further comprising a wireless communication unit.

16. A method for displaying channel information in a digital broadcasting receiver, the method comprising the steps of:

receiving and demodulating a digital broadcasting signal of a selected channel;

demultiplexing the demodulated broadcasting signal, separating Electronic Program Guide (EPG) and broadcasting data, and decoding the broadcasting data;

storing the EPG data, analyzing the EPG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, and generating and storing structured EPG data; and

upon request for displaying the channel information, displaying the EPG data or the structured EPG data selected.

17. The method of claim 16, wherein the step of generating the structured EPG data comprise:

generating first EPG data provided corresponding to a number of the service channels, each of which has service channel information having service channel category and service channel name; and

generating second EPG data having event information broadcasted over the service channel and stored in a broadcasting time sequence, and the event information having a broadcasting start time, a broadcasting time, an event name, and an event summary of a corresponding event.

18. The method of claim 17, wherein the first EPG data further comprises:

a network layer for storing a physical channel identification, broadcasting station information, and a plurality of numbers of the service channels using the physical channel; and

service layers provided corresponding to the number of the service channels, and each storing a service channel identification, a service channel number, a service channel category, and a service channel name.

19. The method of claim 17, wherein the second EPG data comprises event layers provided for a number of programs of a corresponding service channel, and the event layers are provided in number corresponding to the respective service channels and each has the broadcasting start time, the broadcasting time, the event name, an event category, and the event summary.

20. The method of claim 17, wherein the step of displaying the channel information comprise:

upon request for the channel information, prompting user selection of the EPG and structured EPG data; and

upon selection of the EPG data in the above step, displaying the EPG data as the channel information, and upon selection of the structured EPG data, displaying the structured EPG data as the channel information.

21. The method of claim 20, wherein the step of displaying the structured EPG data comprise:

displaying the first EPG data, and guiding for selection of the service channel; and

displaying the second EPG data of the service channel selected in the above step, as the channel information.

22. A method for displaying channel information in a digital broadcasting receiver, the method comprising the steps of:

receiving and demodulating a digital broadcasting signal of a selected channel, and outputting Internet Protocol (IP) datagram data;

decapsulating IP data of the IP datagram data, separating a service data packet stream or an Electronic Service Guide (ESG) data packet steam, and demultiplexing and decoding the service data packet stream into audio and video data;

parsing the ESG data packet stream, and generating and storing structured ESG data;

analyzing the structured ESG data, generating summary information on a service channel-by-service channel basis, generating summary information of programs of respective service channels, and generating and storing structured Electronic Program Guide (EPG) data; and

upon request for displaying the channel information, displaying the selected ESG data or the structured EPG data as the channel information.

23. The method of claim 22, wherein the step of generating the structured EPG data comprise:

upon receipt of the ESG data packet stream, parsing the ESG data, and generating and storing the structured ESG data; and

combining channel information data of a service information fragment and an acquisition fragment of the structured ESG data, generating the summary information of the programs of respective service channels, generating structured first EPG data, combining channel information data of contents fragments and schedule event fragments, and generating and storing structured second EPG data.

24. The method of claim 23, wherein, in the step of generating the first EPG data, a service identification field, a name field, and a genre field of the service information fragment and the acquisition fragment of the structured ESG data are matched to service channel name, category and language, respectively, to generate the first EPG data, and

in the step of generating the second EPG data, a broadcasting start time field of the schedule event fragment of the structured ESG data and a broadcasting field, a title field, a genre field, and a synopsis field of the contents fragment are matched to an event start time, an event broadcasting time, an event name, an event category, an event summary of the event information to generate the structured second EPG data.

25. The method of claim 23, wherein, in the step of generating the first EPG data, a Session Description Protocol (SDP) field of the acquisition information fragment of the structured ESG data is matched to a network layer of the first EPG data, and

a service identification field, a service genre field, and a service name field of the service information fragment are matched to corresponding service channel number, service type, and service channel name of a service layer of the first EPG data, respectively, to generate the structured first EPG data.

26. The method of claim 23, wherein, in the step of generating the second EPG data, a content identification field and the broadcasting start time field of the schedule event fragment of the structured ESG data are matched to event identification and start time of the second EPG data, respectively, and

the broadcasting time field, the title field, the genre field, and the synopsis field of the contents fragment are matched to a broadcasting time, an event name, a content level, and an event summary of the second EPG data, respectively, to generate the structured second EPG data.

27. The method of claim 23, wherein the step of displaying the channel information comprises:

prompting user selection of the ESG and structured EPG data; and

upon selection of the ESG data, displaying the structured ESG data as the channel information, and upon selection of the EPG data, selecting the structured EPG data as the channel information.

28. The method of claim 27, wherein the step of displaying the structured EPG data comprises:

displaying the first EPG data, and guiding for selection of the service channel; and

displaying the structured second EPG data of the selected service channel as the channel information.

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