

Digital TV Receiver : PC Card & STB

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정 주 홍
연구소장

jheong@dstreamtech.com
www.dstreamtech.com

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발표 순서

Part 1. DTV PC Card

- Technology Trend
- Product Status

Part 2. DTV STB

- STB의 구성 요소
- Advanced STB
- Chipset 현황

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HDTV PC Card: Introduction

- Multi-media Function of PC(Entertainment PC)**
 - CD, DVD, ...
 - DTV reception, Reception of Data over Broadcast
 - High resolution of PC display
 - OS Support: DirectX, MS TV Technologies(formerly BDA), ...
 - PC → DTV Receiver

- Progress of PC Technologies**
 - CPU: ~ 1.7GHz
 - GPU(Graphic Processor Unit)
 - Lower cost

- Your PC can be changed into a HDTV receiver with a DTV card: it costs only \$299.**

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HDTV PC Card

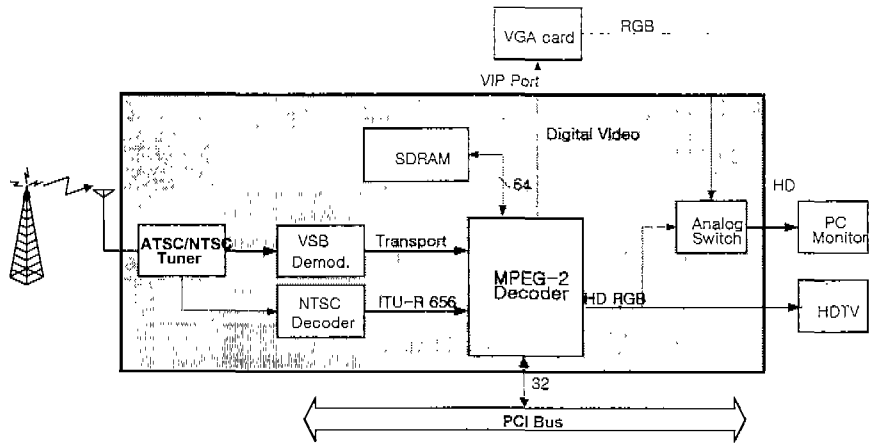
- HW MPEG-2 Decoder Type**
 - High cost, MPEG-2 MP@HL decoder
 - Less PC system dependency
 - PCI I/F

- SW MPEG-2 Decoder Type**
 - Low cost
 - Highly dependent upon PC performance (Graphic processor, CPU, ...)
 - PCI I/F

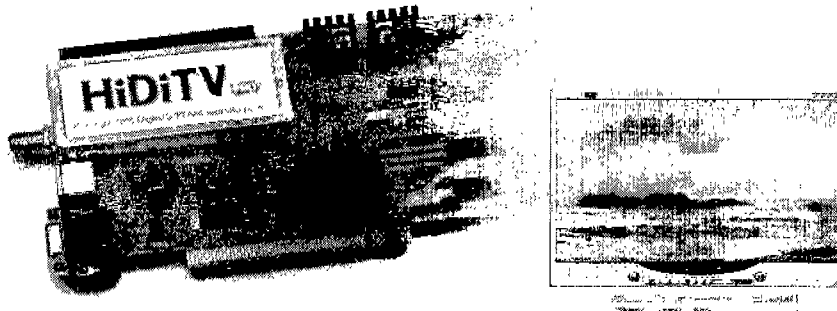
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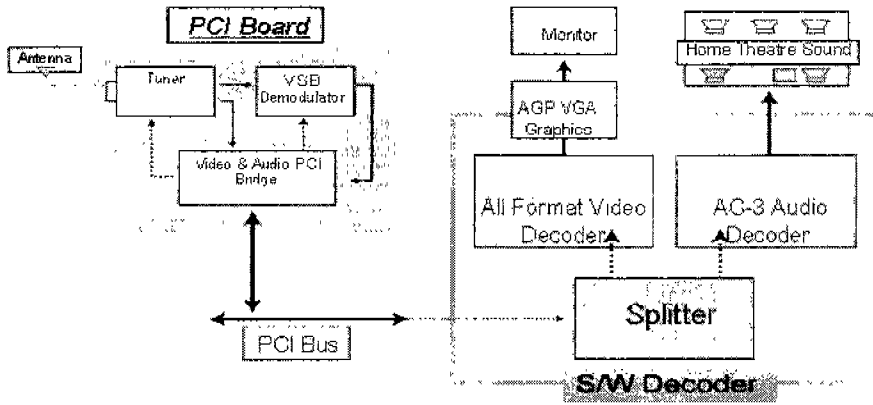
HDTV PC Card: HW decoder



HDTV PC Card: HW decoder



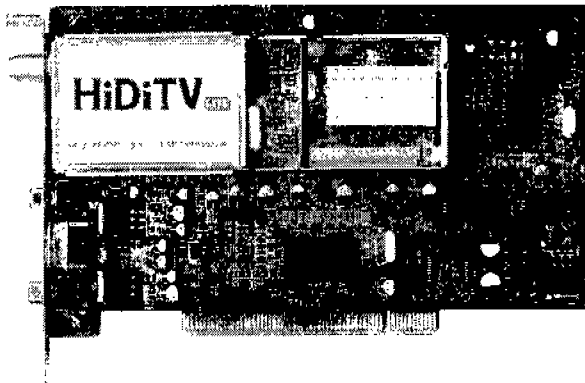
HDTV PC Card: SW decoder



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HDTV PC Card: SW decoder



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HDTV STB:

Basic Model

Advanced STB

STB 개요(1)

- TV set
 - Integrated Receiver and Display Device

- STB
 - Separate Receiver and Display Devices
 - Primary assumption: Using existing display devices
 - PC receiver card, STB
 - Cost sensitive product

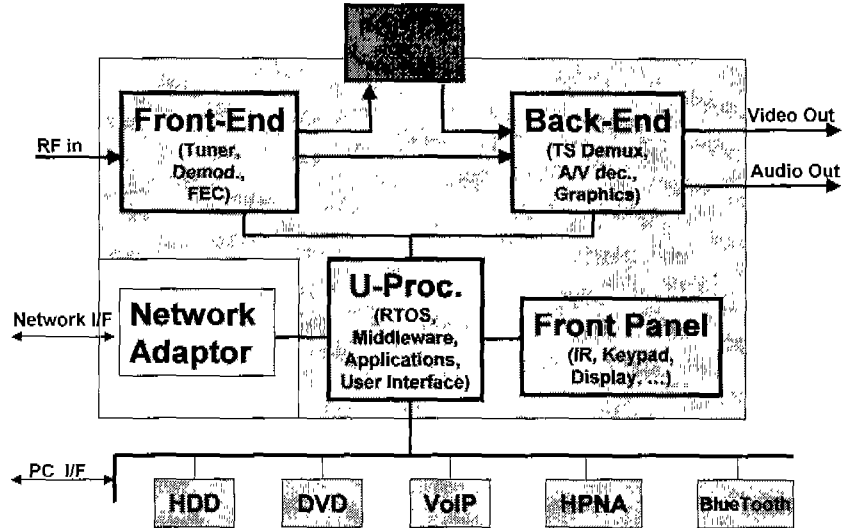
STB 개요(2)

- **Satellite STB**
 - DVB-S/DSS
 - Support SDTV mostly
 - Digital Hi-Vision(Japan, NHK; Dec. 2000~) is the only HDTV services thru satellite.
 - Very low cost[Retail price: \$150~\$200]
- **Terrestrial STB**
 - ATSC vs. DVB-T
 - ATSC eyes on HDTV, DVB-T on SDTV
 - Australia adopted triplecast strategy: HDTV, SDTV, and PAL
- **Cable STB**
 - OpenCable vs. DVB-C
 - Currently SDTV is major market.
 - Integration of OpenCable STB and CableModem is expected in the near future.

STB 개요(3)

- **Fusion of TV and PC**
 - **STB as a Home Gateway**
 - Needs PC function: Web browser, E-mail, ...
 - **PC as a Home Server**
 - Needs STB function: TV receiving, GUI, ...
- **Separation of TV set into Receiver and Display Device**
 - Large screen display such as PDP, LCD, Projection(High cost of products).
 - Several sources of digital TV signals.
 - Frequent change and upgrade of services.

STB 구성 요소(1)



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STB의 구성 요소(2): (External Interfaces)

- **RF interface**
 - Satellite: IF(950MHz~2150MHz)
 - Terrestrial: RF(54MHz~806MHz); 한국, 미국
 - Cable: Bi-directional(Diplex Filter),
RF(F: 54~860MHz, 70~130MHz, R: 8~42MHz); 미국
- **Conditional Access**
 - DVB-CI, POD
 - Integrated CAS or Separable CAS(PCMCIA)
 - Smart Card(Billing, User Identification)
- **Network Interface**
 - Phone line modem
 - ADSL
 - Cable Modem

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STB의 구성 요소(3)

(External Interfaces: cont'd)

- **Video Out**
 - RGBHV, YPbPr with sync on Y signal
 - Down converted CVBS, S-video, Ch 3/4
 - DVI out(DDWG DVI Spec. 1.0)
- **Audio Out**
 - 5.1 analog out
 - Compressed digital audio out, PCM stereo out(IEC61937)
- **PC, Home appliance Interfaces**
 - Ethernet
 - USB
 - IEEE1394
 - HPNA
 - BlueTooth

Front-End Function

- **RF tuner**
 - NTSC channel selection
 - ATSC channel Selection
- **ATSC Demodulator**
 - Equalizer
 - Demodulator
 - FEC decoder(RS, Viterbi decoder)
 - Serial/Parallel TS out
- **NTSC Demodulator**
 - Video demodulator
 - Stereo sound demodulator(Dual carrier, BTSC, ...)
- **Tuner and Demodulator control**
 - I²C
 - Proprietary schemes

Back-End Function

- **TS Demultiplexer**
 - PSI/SI/PSIP decoding
 - PID filter(# of PIDs filtered simultaneously)
 - Video/Audio/Data extraction
- **Video Decoder/processor**
 - MPEG-2 MP@HL, MP@ML decoder
 - Format Converter
 - Graphic Processor
 - Inverse Telecine
- **Audio Decoder**
 - MPEG-1 layer-II(MUSICAM), MPEG-2, MPEG-2 AAC
 - AC-3
- **u-Processor Interface**
 - PCI 2.2
 - Proprietary schemes
- **SDRAM Interface**
 - Data bus width(64bit/32bit)
 - Clock speed

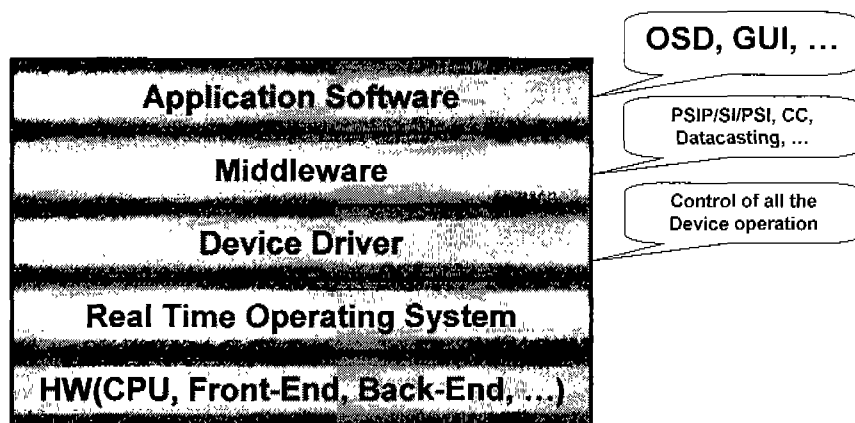
u-Processor Function

- **Alternatives**
 - MIPS series, ARM series, PowerPC series
 - Embedded core
- **Interface with FE, BE and other chips**
 - PCI, I2C, GPIO, IDE
- **Computing power**
 - 80MIPS ~ 350MIPS
- **Memory Interfaces**
 - DRAM
 - Flash Memory, EEPROM
- **SDRAM Interface**
 - Data bus width(64bit/32bit)
 - Clock speed(100MHz~)
- **Peripheral Integration**
 - Ethernet, Serial I/O
 - IR, Keypad, ...

Front-Panel Function

- **Key-pad function**
 - Menu, select, move(up, down, left, right)
- **Display device**
 - LCD Display or 7-segment LED
 - Channel number, ...
- **Remote control**
 - Numeric key pad
 - Key-pad
 - IR key-board
- **LED display**
 - Power on
 - Key scan ACK

STB SW Stack



Middleware and RTOS

- **RTOS**
 - VxWorks, pSOS, uCOS, Nucleus, Linux, WinCE, ...
 - Choice of RTOS depends upon the cost and
 - the functionalities supported.

- **Middleware**
 - Strongly depends on Service Provider's choice.
 - For FTA(Free-To-Air) market, Middleware can be excluded.
 - Liberate, NDS, MSTV, OpenTV, PowerTV, ...

Advanced STB

- **Features for Advanced STB(as a Home Gateway)**
 - Functionalities for back-channel(Phone Line Modem, ADSL, Cable Modem)
 - Local Storage(HDD)
 - Functionalities for In-Home Networking(USB, IEEE1394, HPNA, BlueTooth, ...)
 - Functionalities for audio-visual communications(VoIP, Visual Telephony, ...)

- **Advanced Services**
 - Enhanced TV(PVR, time-shift, ...)
 - Features for TVAF and MPEG-7(Video summary, search, ...)
 - T-commerce

Required License Agreements

- **Front-End**
- **MPEG-2 decoder**
- **AC-3 decoder**
- **Middleware**
- **Real Time OS**

Chip-set

- **Companies**
 - **ST Microelectronics, TeraLogic, Broadcom**
 - **Conexant, IBM, LSI**
- **ASICs for SDTV STB**
 - **Integration of Front-End, Back-End and u-Processor**
 - **All-in-One SOC(Systems on a Chip) ASICs are available now.**
- **ASICs for HDTV STB**
 - **Separated Front-End, Back-End and u-Processor**

Thank you!!!

Q & A