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The MMPM subsystem and USBAUDIO.SYS

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- Brief (incomplete) overview of MMPM subsystem
- Brief overview of USB stack
- USB Audio device class
- USBAUDIO
- USBWAV
- Conclusions
- Acknowledgements
- Closing words

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- MPPM (Multimedia Presentation Manager) subsystem
 - MCI (Media Control Interface)
 - Provides services to play/record audio/pictures/video
 - MMIO (Multimedia I/O)
 - Provides services to access media content (audio/pictures/video) in files/memory buffers / via internet etc. via „IO Procedures“ (implemented in DLL, executing at application privilege level)
 - includes CODEC support services (implemented in DLL, executing at application privilege level)

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- USB stack
 - HC (host controller) drivers: USBxHCD.SYS
(x = U|O|E)
 - do the „real work“ (program the HW, handle HW interrupts)
 - Interface with the central management driver
USBD.SYS
 - Class drivers:
USBHID.SYS, USBMSD.ADD, USBCOM.SYS, USBPRT.SYS, USBETHR.OS2, USBAUDIO.SYS

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- USB stack, continued
 - Client drivers: USBKBD.SYS, USBMOUSE.SYS
 - Similar to class drivers
 - „set up“ the data transfer for HID (human interface device) devices
 - For input, receive the data (sent by the host controller drivers) and pass on to initial requester
 - Handle the data transfer notification (sent by the host controller drivers)

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- USB Audio device class
 - Supports audio recording and playback
 - Supports a broad range of controls:
 - Volume, bass, treble, balance
 - Dolby surround etc. etc. etc.
 - Setting sampling rate, automatic pitch adjust

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- USBAUDIO.SYS
 - handles the „Audio Device“ class
 - only Version 1 of audio device class USB spec supported
 - MIDI „not really“ supported (some code exists ...)
 - Supports volume, bass, treble control, supports setting sampling rate but sampling rate setting is limited ...
 - Most devices only support 44.1 kHz or 48 kHz or both

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- USBWAV.DLL
 - An IO Procedure to support automatic sample rate conversion for a fixed number of source and target sample rates
 - Upsampling and channel duplication via sample duplication (not very HiFi ...)
 - Only works if target sampling rate is an even multiple of source sampling rate
 - allocates all its memory in „high memory“ :-)
 - Employs exception handling to protect your WPS :-)

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- USBAUDIO.SYS history and status
 - Last IBM version (10.57 ?) already trapped on system start: completely unusable
 - We only have some DDK code available that is a „snapshot“ of a point in time
 - AN 11.14 delivers a working USBAUDIO.SYS (with the most dominant bugs fixed)
 - Continued development from AN 11.14 on:
 - Fixed volume,bass,treble controls

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- Conclusions
 - We have working USB audio
 - We can handle „legacy“ (legacy = outdated) sampling rates: 8000 Hz, 11025 Hz, 22050 Hz
 - We have additional CODEC support for A-Law and U-Law compressed files
 - We have filled the gap until we have an updated UNIAUD :-)
 - find at Hobbes:
<http://hobbes.nmsu.edu/h-search.php?>

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- Acknowledgements
 - Wim Brul for his work on USBAUDIO.SYS as well as USBEHCD.SYS
 - Neil Waldhauer, Wim Brul, Yurio Dario and numerous others for testing, reporting bugs and traps

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- Closing words
 - Report traps, a trap screen works miracles (most of the time at least) !
 - Learn how to use tracing, a trace can also work miracles !
 - State necessary info (what driver version, what did you do to provoke the trap)