NVIDIA BIT_DISPLAY_PTRS ('U'), BIT_DP_PTRS ('d')

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BIT_DISPLAY_PTRS ('U')

Display Script Table

The root data structure for the IEDTable system is the DisplayScriptTbl structure defined below. Note that it consists of a single header, DisplayScriptTblHdr, and a variable number of entries, the DisplayScriptTblEntry structures. It is legal for no DisplayScriptTblEntrys to exist (e.g., a design that only stuffs a single VGA connector to an internal DAC).

```
DisplayScriptTblHdr struct
   Version
               db
                      22h ; The latest version is 2.2, initial version is
2.0
  HeaderSize
              db
                       5
                              ; Header size = SIZEOF(DisplayScriptTblHdr)
  EntrySize
                       2
                              ; Entry size = SIZEOF(DisplayScriptTblEntry)
               db
  EntryCount
               db
                       ?
                              ; Number of entries
   TargetSize db
                       14
                              ; Size of the structure that the entries point
to SIZEOF(IEDTable)
 DisplayScriptTblHdr
                    ends
```

```
DisplayScriptTblEntry struct
IEDTablePtr dw 0000h ; pointer to Init/Enable/Disable Table
(IEDTable)
DisplayScriptTblEntry ends
...
```

The DisplayScriptTbl will be directly accessible via a pointer from the BIT, and if the table is not present, the BIT will contain a null pointer. The IEDTables are the main secondary structures. There is a 1:1 relationship between the number of IEDTables and the number of DisplayScriptTbl.IEDTablePtr records (except for the cases of a NULL IEDTablePtr, which is valid).

```
IEDTable struct ; SIZEOF(IEDTable) = 12 bytes
  IEDTkey
              IEDkey ; 4 bytes of InitEnableDisable key to match DCB info
                      00h ; Flags
  Flags
              db
                         ; [0:0] = Reserved
                         ; [1:1] = Driver Skip (1 = skip, 0 = process)
                         ; [2:2] = Manual power control
                         ; (1 = manual, 0 = automatic)
                         ; all other bits reserved for future use
  RuntimeCountdb
                      00h
                               ; Number of IEDTRuntimeSettingsEntry
structures
                                  ; following this IEDTable
  InitScript dw
                      0000h
                              ; ptr to devinit script to initialize HW
resource
  OffINT1Script
                             0000h
                                      ; ptr to devinit script to OffINT1 HW
                      dw
resource
  OffINT2Script
                      dw
                             0000h
                                      ; ptr to devinit script to OffINT2 HW
resource
```

```
IEDTable ends
 IEDTRuntimeSettingsEntry STRUCT
                       00h
   Protocol
               db
                              ; Output Resource Protocol for this entry
   DeviceFlags db
                       00h
                              ; Device specific flags
                                    ;(dlink/slink, 18/24 bpp, etc.) for this
entry
   OnINT2Table dw
                       0000h
                                ; Pointer to SorClkMode array for scripts to
run
                                    ; during supervisior interrupt 2
   OnINT3Table dw
                      0000h
                                ; Pointer to SorClkMode array for scripts to
run
                                    ; during supervisior interrupt 3
 IEDTRuntimeSettingsEntry ENDS
```

The IEDTkey is used to match against a particular DCB record. To this end, the alignment of the relevant bit fields in the IEDTkey were chosen to exactly match up to the bit fields in the DCB 3.0 specification. The algorithm for matching an IEDTkey to a DCB is described below. A match is made when the followings are all true:

- 1. The IEDTkeyDCBDPI.Type, Location, and IEDTkeyDCBDSI.SubType bit fields match all of the equivalent DCB bit fields—i.e., all bit field 1's and 0's are identical.
- 2. The IEDTkeyDCBDPI.Head bits which are set to 1 correspond to the head (display pipe) the device is attached to --i.e., (IEDTkeyDCBDPI.Head & CurrentHead) != 0.
- All of the IEDTkeyDCBDPI.Outdev bits which are set to 1 correspond to any of the DCB.OutDev bits which are set to 1—i.e., (IEDTkeyDCBDPI.Outdev & DCB.Outdev) != 0.
- For version 2.1, all of the IEDTkeyDCBDPI.Sublink bits which are set to 1 correspond to any of the DCB.Sublink bits which are set to 1-i.e. (IEDTkeyDCBDPI.Sublink & DCB.Sublink) != 0.

For IED 2.0, this is the IEDKey:

```
IEDTkey RECORD ; SIZEOF(IEDTkey) = 4 bytes, in MSb to LSb order
  Reserved: 6 ; [31:26]=000000 (hex). Unused.
  Head: 2 ; [25:24]=DCB.Head Bitmask {b0=HeadA,b1=HeadB}
  Reserved: 4 ; [23:20]=0000 (binary). Unused.
  OutDev: 4 ; [19:16]=depends on DCB.Type: DAC/Link/MIO {A,B,C,D}
  SubType:8 ; [15:08]=DCB.DSI.Encoder/ExtLinkType used if
Location=OnBoard.
                    SubType interpretation depends on Type:
                ;
                ; if Type=CRT: Unused, set to=00h
                ; if Type=TV: {BT868,CX871,CH7007,PH7108B,...}
                ; if Type=LCD-TMDS {SI164,SI178,CH7009,SI164alt,CH7301}
                ; if Type=LCD=LVDS {CH7019,NSDS90C387}
  Reserved: 2 ; [07:06]=00 (binary). Unused.
  Location: 2 ; [05:04]=DCB.Location {OnChip,OnBoard}
  Type: 4 ; [03:00]=DCB.Type {CRT, TV, LCD-TMDS, LCD-LVDS}
IEDkeyDCBDSI ends
```

For IED 2.1, DCB.DSI.SubLink is added to the previous reserved field:

```
IEDTkey RECORD ; SIZEOF(IEDTkey) = 4 bytes, in MSb to LSb order
Reserved: 4 ; [31:28]=000000 (hex). Unused.
Head: 4 ; [27:24]=DCB.Head Bitmask
{b0=HeadA,b1=HeadB,b2=HeadC,b3=HeadD}
SubLink: 2 ; [23:22]=DCB.DSI.SUBLINK
Reserved: 2 ; [21:20]=0000 (binary). Unused.
OutDev: 4 ; [19:16]=depends on DCB.Type: DAC/Link/MIO {A,B,C,D}
```

For IED 2.2, DCB.DSI.PadLink replaces DCB.DSI.SubLink and OutDev will use Pad Macro Index instead of Link/SOR. This is to match DCB 4.1.

```
IEDTkey RECORD ; SIZEOF(IEDTkey) = 4 bytes, in MSb to LSb order
Reserved: 4 ; [31:28]=000000 (hex). Unused.
Head: 4 ; [27:24]=DCB.Head Bitmask
{b0=HeadA,b1=HeadB,b2=HeadC,b3=HeadD}
PadLink: 2 ; [23:22]=DCB.DSI.PADLINK
Reserved: 2 ; [21:20]=0000 (binary). Unused.
OutDev: 4 ; [19:16]=depends on DCB.Type: DAC/Pad Macro Index/MIO
{A,B,C,D}
SubType: 8 ; [15:08]=DCB.DSI.Encoder/ExtLinkType used if
Location=OnBoard.
; SubType interpretation depends on Type:
; if Type=CRT: Unused, set to=00h
```

```
; if Type=TV: {BT868,CX871,CH7007,PH7108B,...}
; if Type=LCD-TMDS {SI164,SI178,CH7009,SI164alt,CH7301}
; if Type=LCD=LVDS {CH7019,NSDS90C387}
Reserved: 2 ; [07:06]=00 (binary). Unused.
Location: 2 ; [05:04]=DCB.Location {OnChip,OnBoard}
Type: 4 ; [03:00]=DCB.Type {CRT,TV,LCD-TMDS,LCD-LVDS}
IEDkeyDCBDSI ends
```

The flag at IEDTable.Flags.1 is used to signal to the Resource Manager that it should not process the entry for that device. The Resource Manager should instead either not utilize the device or use any hard coded initialization it has available. This allows entries to be added for the use by the VBIOS that are either not tested yet with the Resource Manager or that are not appropriate for use by the Resource Manager for other reasons.

The flag at IEDTable.Flags 2 is used to signal that a device requires "manual" power control. These are usually PIOR devices that require a running pixel clock when communicating with the device via the I2C protocol. See the <u>Device Control Specification</u> for more information.

The **InitScript** field points to a devinit script to run at boot time. At boot, the software performing the GPU initialization (VBIOS, resman, fcode, etc.) loops through each DCB entry present in the firmware image and looks for a matching IEDT entry. For each one it locates, the software must execute the InitScript for that entry. If the InitScript field is NULL, execution of the script is skipped.

The **OffINT1Script** field points to a script that must be run during Supervisior Interrupt 1 for a matching device if the device was previously running before the display update (mode set) and is now being shutdown, either because the device is being disabled or because of a change in backend timings or pixel clock. If the OffINT1Script field is NULL, execution of the script is skipped.

The **RuntimeCount** field is a count of how many IEDTRuntimeSettingsEntry structures are immediately following this IEDTable structure. Each IEDTRuntimeSettingsEntry structure represents a possible runtime configuration of the matching device. It is possible for some runtime configurations to not have any matching entries. It is also possible for RuntimeCount to be zero for a device that only has an InitScript and/or OffINT1Script.

The Protocol and DeviceFlags fields are used to locate the correct IEDTRuntimeSettingsEntry structure to use for a running device. The Protocol field of the entry to use must match the EVO protocol value of the device in affect. A Protocol field of IEDT_PROTOCOL_ALL is a wildcard protocol that matches any protocol value. The DeviceFlags field varies depending on the device type in use. Currently only flags for flat panels are defined (all other devices always have the DeviceFlags field set to zero). The currently defined flags are:

```
Bit 0 - Link Count
0 = Single link
1 = Dual link
Bit 1 - Bits per pixel (LVDS only, always zero for TMDS)
0 = 18 BPP
1 = 24 BPP
```

If the device matching the IEDTable is in a configuration that matches a particular **IEDTRuntimeSettingsEntry** the **OnINT2Table** and **OnINT3Table** fields are processed. **OnINT2Table** and **OnINT3Table** are processed if the device was shutdown and is now being started (such as for a pixel clock or backend timings change or for a device that is just now being enabled). **OnINT2Table** is using during Supervisor Interrupt 2 and **OnINT3Table** is used during Supervisor Interrupt 3

Both **OnINT2Table** and **OnINT3Table** point to an array of SorClkMode structures. The intent is to allow support for devices where the initialization requirements depend on the target sor_clk frequency. sor_clk is generally equal to pixel clock. Exceptional cases are dual-link DVI along with HDMI Deep Color and Pixel Replication modes.

```
SorClkMode struct ; identical to legacy TMDSMode{}
SorClkFreq dw 0000h ; if target sor_clk > this sor_clk, run script
InitScript dw 0000h ; ptr to devinit script to initialize HW
resource
SorClkMode ends
```

The array of SorClkMode structures is scanned starting with the first entry. The first entry encountered with a frequency that is less than the device's current sor_clk is the one

chosen. The SorClkFreq field value is specified in 10 kHz units. The devinit script pointed to by the InitScript field of the chosen entry is executed. The last entry in an array of SorClkMode structures will always have a frequency of 0 kHz so that a valid entry is always found.

Is it is valid for either **OnINT2Table** or **OnINT3Table** to be NULL pointers, in which case script execution is skipped for that period. Also, it is valid for any of the script pointers in the array of SorClkMode structures to be NULL, in which case script execution is skipped as well.

For a device that does not have scripts that are a function of frequency there will be only one SorClkMode structure with the SorClkMode.SorClkFreq field specified as 0 kHz.

Display Control Flag Byte

[0:0] = Reserved

[1:1] = NO_DISPLAY_SUBSYSTEM: Display subsystem isn't included in the GPU
(used for displayless coproc)
[2:2] = Reserved

[3:3] = VBIOS avoids touching mempool while drivers running

- [4:4] = Offset PCLK between 2 heads
- [5:5] = Boot with DP Hotplug disabled
- [6:6] = Allow detection of DP sinks by doing a DPCD register read
- [7:7] = Reserved

BIT_DP_PTRS ('d')

BIT_DP_PTRS ('d') - DP Info Table contains tables and scripts to enable the support of various DP functionality. DP Info Table can be referenced through BIT_TOKEN_DP_PTRS('d') in BIT table.

DP Info Table

DP Info Table consists of the following parts:

Header - The version number (0x4x for Version 4.x), header size, the size of each DP Info Table Entry, the number of Entries, size of the structures that the entries point to, size of each level entry, and a flag byte.

DP Info Table entries list - One for each DP link. Each entry consists a pointer which points to the corresponding Target Entry(DPInfoStruct).

DP Info Table Header

Name	Bit width	Values and meaning	
Version	8	Version # of the DP Info Table Header and Entries. Currently, this is 0x41 for version 4.1 and 0x42 for version 4.2 (Pascal onward).	
Header Size	8	Size of the DP Info Table Header in Bytes. Currently, this is 9 bytes.	
Entry Size	8	Size of Each Entry in bytes. With DP Info Table 4.x, this field should be 2.	
Entry Count	8	Number of DP Info Table Entries starting directly after the end of this table.	
Target Size	8 Size of the structure that the entry bytes. With the latest version of DI Table 4.x, this field should be 19.		
Level Entry Table Count	8	Number of Level Entry Tables. It can be either 2 or 3 for DP Info Table version 4.2.	
Level Entry Size	8	Size of each level entry in Level Entry Table. With DP Info Table 4.1, this field should be 4. With DP Info Table 4.2, this field should be 3.	
Level Entry Count	8	Number of entries in Level Entry Table. With DP Info Table 4.1, this field should be 40. With DP Info Table 4.2, this field should be 10.	
Flags	8	Each bit flag has a different meaning. All non-defined bits must be set to 0: Bit 0: 1-force SST	
		Bit 0: 1-force SST Bit 1: 1-force MST	

	Bit 2: MST, 0-disabled, 1-enabled Bit 3: SC(Stream Cloning), 0- disabled, 1-enabled Bit 4: PostCursor2 Support (Not present in version 4.2), 0-enabled, 1-disabled
Regular VSwing	 Regular VSwing is applicable for linkrate lower than HBR3. Applicable only for version 4.2. [7:0] = Regular_VSwing_DRVI: Active high output driver current control. This is 6 bits in actual register, reserving a byte. [11:8] = Regular_VSwing_DRVZ: Active high driver output impedance control. This is 3 bits in actual register, reserving a nibble. [15:12] = Regular_VSwing_CMH: Active high signal to control the output common mode voltage. This is 2bits in actual register, reserving a nibble.
Low VSwing	 Low VSwing is applicable for HBR3. Applicable only for version 4.2. [7:0] = Low_VSwing_DRVI: Active high output driver current control. This is 6 bits in actual register, reserving a byte. [11:8] = Low_VSwing_DRVZ: Active high driver output impedance control. This is 3 bits in actual register, reserving a nibble. [15:12] = Low_VSwing_CMH: Active high signal to control the output common mode voltage. This is 2bits in actual register, reserving a nibble.

DP Info Table Entries

This follows right after DP Info Table Header. Each entry is 2 bytes, a pointer pointing to the corresponding Target Entry(DPInfoStruct). There is one entry for each DP link. The number of DP Info Table entries is listed in the DP Info Table Header.

Name	Bit width	Values and meaning
TargetEntryPtr	16	Pointer to the corresponding Target Entry(DPInfoStruct).

DP Info Level Entry Table

This table starts directly after the end of DP Info Table Entries. DP Info Table Header has the information of number of level entry tables, size of each entry, and number of entries in each table. This table is used to set up GPU pri-register value for PostCursor2, Drive Current, Pre-Emphasis, and TxPu when the corresponding PostCursor2, DriveCurrent, Pre_Emphasis levels are requested by sink through DPCD. The number of entries in this table is defined in DPInfoStruct above. The size of each entry is defined in DP Info Table Header.

Here is level entry's format for DP Info Table 4.0 and 4.1:

Name	Bit width	Values and meaning
PostCursor2	8	Value to set in GPU for PostCursor2. Not present with DP Info Table 4.2.
DriveCurrent	8	Value to set in GPU for DriveCurrent
PreEmphasis	8	Value to set in GPU for Pre-Emphasis
TxPu	8	Value to set in GPU for TX pull-up current source drive

Here is one DP Info Table Level Table for version 4.0 and 4.1, the sequence of PostCursor2,

DriveCurrent, and Pre-Emphasis levels are indicated at the right side of each entry:

DPInfoLevelEntryStart LABEL DPInfoLevelEntry DPInfoLevelEntry{ 000h, 011h, 000h, 02h } ; 0, 0, 0

		0451					~		
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{	000h,	022h,	000h,	04h	}	;	Ο,	2,	0
DPInfoLevelEntry{	000h,	02bh,	011h,	04h	}	;	Ο,	2,	1
DPInfoLevelEntry{	000h,	033h,	000h,	04h	}	;	Ο,	З,	0
DPInfoLevelEntry{	000h,	011h,	000h,	02h	}	;	1,	Ο,	0
DPInfoLevelEntry{	000h,	015h,	004h,	02h	}	;	1,	Ο,	1
DPInfoLevelEntry{	000h,	01ah,	008h,	04h	}	;	1,	Ο,	2
DPInfoLevelEntry{	000h,	022h,	011h,	04h	}	;	1,	Ο,	3
DPInfoLevelEntry{	000h,	01ah,	000h,	04h	}	;	1,	1,	0
DPInfoLevelEntry{	000h,	020h,	006h,	04h	}	;	1,	1,	1
DPInfoLevelEntry{	000h,	027h,	00dh,	04h	}	;	1,	1,	2
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{	000h,	033h,	000h,	04h	}	;	1,	З,	0
DPInfoLevelEntry{	000h,	011h,	000h,	02h	}	;	2,	Ο,	0
DPInfoLevelEntry{	000h,	015h,	004h,	02h	}	;	2,	Ο,	1
DPInfoLevelEntry{									
DPInfoLevelEntry{	000h,	022h,	011h,	04h	}	;	2,	Ο,	3
DPInfoLevelEntry{	000h,	01ah,	000h,	04h	}	;	2,	1,	0
DPInfoLevelEntry{	000h,	020h,	006h,	04h	}	;	2,	1,	1
DPInfoLevelEntry{	000h,	027h,	00dh,	04h	}	;	2,	1,	2
DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{	000h,	033h,	000h,	04h	}	;	2,	З,	0
DPInfoLevelEntry{	000h,	011h,	000h,	02h	}	;	З,	Ο,	0
DPInfoLevelEntry{	000h,	015h,	004h,	02h	}	;	З,	Ο,	1
DPInfoLevelEntry{									
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DPInfoLevelEntry{									
DPInfoLevelEntry{									
DPInfoLevelEntry{								з,	
- 1 (,	,	,		,		,	,	

Here is the DP Info Level Table Entry format for version 4.2:

Name Bit width	Values and meaning
-------------------	--------------------

DriveCurrent	8	Value to set in GPU for DriveCurrent
PreEmphasis	8	Value to set in GPU for Pre-Emphasis
ТхРи	8	Value to set in GPU for TX pull-up current source drive

Here is one DP Info Table Level Table for version 4.2, the sequence of DriveCurrent, and Pro-Emphasic lovels are indicated at the right side of each entry:

Pre-Emphasis levels are indicated at the right side of each entry:

DPInfoLevelEntryStart LA	BEL DI	PInfoL	evelE	Entry			
DPInfoLevelEntry{	011h,	000h,	02h	}	;	Ο,	0
DPInfoLevelEntry{	015h,	004h,	02h	}	;	Ο,	1
DPInfoLevelEntry{	01ah,	008h,	04h	}	;	Ο,	2
DPInfoLevelEntry{	022h,	011h,	04h	}	;	Ο,	3
DPInfoLevelEntry{	01ah,	000h,	04h	}	;	1,	0
DPInfoLevelEntry{	020h,	006h,	04h	}	;	1,	1
DPInfoLevelEntry{	027h,	00dh,	04h	}	;	1,	2
DPInfoLevelEntry{	022h,	000h,	04h	}	;	2,	0
DPInfoLevelEntry{	02bh,	011h,	04h	}	;	2,	1
DPInfoLevelEntry{	033h,	000h,	04h	}	;	3,	0

DP Info Table Target Entry

Each DP Info Table Entry points(when it's not NULL) to on Target Entry(i.e. DPInfoStruct).

Name	Bit width	Values and meaning
Кеу	32	Key to match DCB info(same as IEDT Key).
Flags	8	Each bit flag has a different meaning. All non-defined bits must be set to 0: Bit 0: 1-use SPPLL0, 0-not use SPPLL0 Bit 1: 1-use SPPLL1, 0-not use SPPLL1 Bits 3:2: reserved for SPPLLx Bit 4: default color depth, 0-24bpp, 1-18bpp
BeforeLinkTraining	16	Pointer to the script to run before link training

AfterLinkTraining	16	Pointer to the script to run after link training
BeforeLinkSpeed	16	Pointer to an array of scripts to run before set up link speed
EnableSpread	16	Pointer to script to run when enable spread
DisableSpread	16	Pointer to script to run when disable spread
DisableLT	16	Pointer to script to run to disable what was set up by BeforeLinkTraining
LevelEntryTableIndex	8	The index to Level Entry Table to use
HBR2MinVDTIndex	8	Reserved

Before Link Training Script

This script is pointed by BeforeLinkTraining in DP Info Table Target Entry. It should be run before link training.

After Link Training Script

This script is pointed by AfterLinkTraining in DP Info Table Target Entry. It should be run after link training.

Before Link Speed

This is an array of scripts which is pointed by BeforeLinkSpeed in DP Info Table Target Entry. It should be run before set up and/or change link speed. As it is now, there are four link speeds defined. Each entry in the array is LinkRateMode struct which is defined below.

GP100 will be the first chip to have 4 link speeds with the introduction of HBR3. Kepler and Maxwell have 3 link speed entries.

Name	Bit width	Values and meaning
LinkRate	8	Indicate the link rate, 06h=1.62G, 0Ah=2.7G, 14h=5.4G, 1Eh=8.1G

LinkRatePtr	16	Pointer to the script to run for this link rate

BeforeLinkSpeed_SOR_ALL LABEL LinkRateMode

LinkRateMode { 1Eh, OFFSET BeforeLinkSpeed_SOR_ALL_810 }

LinkRateMode { 14h, OFFSET BeforeLinkSpeed_SOR_ALL_540 }

LinkRateMode { 0Ah, OFFSET BeforeLinkSpeed_SOR_ALL_270 }

LinkRateMode { 06h, OFFSET BeforeLinkSpeed_SOR_ALL_162 }

Enable Spread Script

This script is pointed by EnableSpread in DP Info Table Target Entry. It should be run before enable spread.

Disable Spread Script

This script is pointed by DisableSpread in DP Info Table Target Entry. It should be run before disable spread.

Disable Link Training Script

This script is pointed by DisableLT in DP Info Table Target Entry. It should be run to disable what was set up by BeforeLinkTraining.

Last updated 7/14/16