IP-Agnostic Dual-BDF Vendor-Specific Capability (PCI/PCIe)

White Paper Document

Version 1.0

May 2023

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Release History

Version	Comments	Issue Date
1.0	First release	May 2023

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1 Introduction

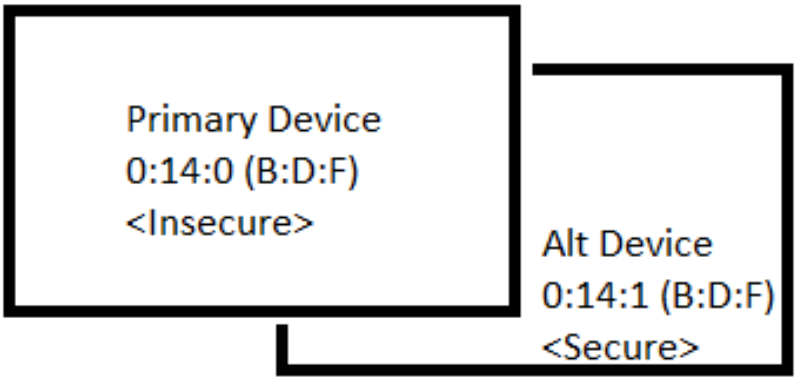
1.1 Overview

Platforms that require isolation between secure PCI traffic and non-secure PCI traffic can advertise an alternate function number behind the primary Bus:Device:Function. It is up to the software implementation to determine if the alternate function be used for secure traffic and the primary function be used for non-secure traffic or vice-versa. This concept of a 'shadow' alternate function is called Dual-BDF.

PCIe specification defines a "Vendor-Specific Capability", which is a capability structure in PCI-compatible Configuration Space that can be used by a vendor to define a vendor-specific information. This whitepaper document defines one implementation approach to implement a set of IP-Agnostic Dual-BDF Vendor-Specific Capability registers. By using Vendor-Specific Capability, any PCI and PCIe device will be able to implement this Dual-BDF feature. The content of this Dual-BDF Vendor-Specific Capabil-ity will use the Designated Vendor-Specific Extended Capability (DVSEC) Header 1 and Header 2 in consideration of future standardization for all IPs to move to PCIe DVSEC – it is required that Software follows the PCIe Specification when interpreting the DVSEC fields.

This Vendor-Specific Capability helps define an agnostic mechanism of discovering the presence and function number of the alternate function. This Vendor-Specific Capability shall be advertised from the Primary BDF.

Figure 1-1. Example Primary PCI Endpoint with Alternate Secure PCI Endpoint



1.2 Related Documents

Document	Location
xHCI Specification Revision 1.2 Section 4.25 USB Virtualization Based Trusted IO Management (USB VTIO)	https://www.intel.com/content/dam/www/public/us/en/documents/technical-specifications/extensible-host-controler-interface-usb-xhci.pdf

2 Dual-BDF Vendor-Specific Capability

Figure 2-1. Vendor-Specific Capability

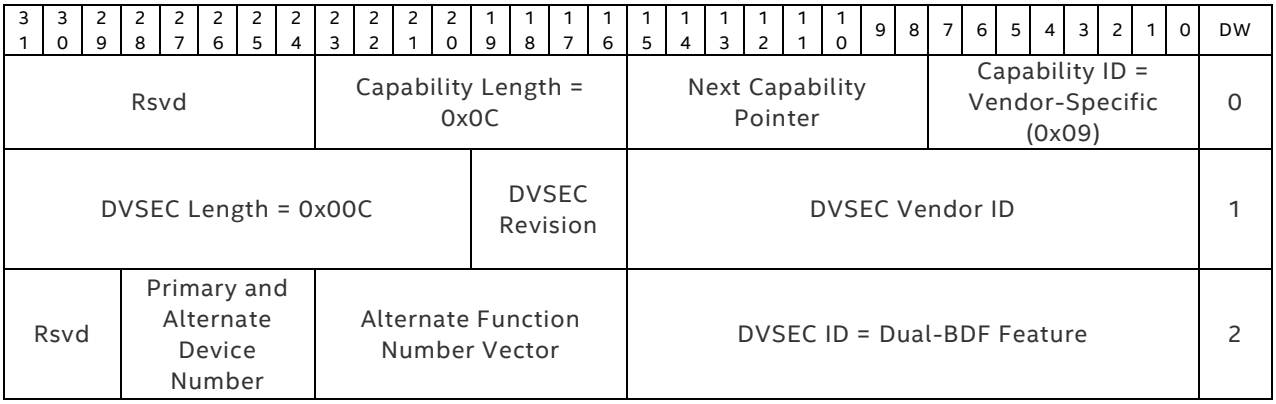


Table 2-1. Dual-BDF Vendor Specific Capability

Bit Location	Description	Attributes
DW0 Bit 7:0	**Capability ID** - Indicates the PCI Express Capability structure. This field must return a Capability ID of 09h indicating that this is a Vendor-Specific Capability structure.	RO
DW0 Bit 15:8	**Next Capability Pointer** - This field contains the offset to the next PCI Capability structure or 00h if no other items exist in the linked list of Capabilities.	RO
DW0 Bit 23:16	**Capability Length** - This field provides the number of bytes in the Capability structure (including the three bytes consumed by the Capability ID, Next Capability Pointer, and Capability Length field). *Dual-BDF Feature Capability Length is 0xC.*	RO
DW0 Bit 31:24	**Reserved**	RO
DW1 Bit 15:0	**DVSEC Vendor ID** - This field is the Vendor ID associated with the vendor that defined the contents of this capability. *Shall be 0x8086 (if the vendor intends to use the Intel VID) or 0x1ECO (if the vendor intends to use the USBIF VID).*	RO
DW1 Bit 19:16	**DVSEC Revision** - This field is a vendor-defined version number that indicates the version of the DVSEC structure. Software must qualify the DVSEC Vendor ID and DVSEC ID before interpreting this field. *0x0: First revision.*	RO
DW1 Bit 31:20	**DVSEC Length** - This field indicates the number of bytes in the entire DVSEC structure, including the PCI Express Extended Capability Header, the DVSEC Header 1, DVSEC Header 2, and DVSEC vendor-specific registers. *Dual-BDF Feature DVSEC Length is 0xC.*	RO

Bit Location	Description	Attributes
DW2 Bit 15:0	**DVSEC ID** - This field is a vendor-defined ID that indicates the nature and format of the DVSEC structure. Software must qualify the DVSEC Vendor ID before interpreting this field. *Dual-BDF Feature DVSEC ID* *Shall be set to 09h if the DVSEC vendor ID field is set to 0x8086.* *Shall be set to 02h if the DVSEC vendor ID field is set to 0x1EC0.*	RO
DW2 Bit 23:16	**Alternate Function Number Vector** – This field is the Function Number of the Alternate Device, converted to 1-hot encoding. Example: Function Number 0 = 0x01 Function Number 1 = 0x02 … Function Number 7 = 0x80	RO
DW2 Bit 28:24	**Primary and Alternate Device Number** - This field is the Device Number for both the Primary Device and Alternate Device.	RO
DW2 Bit 31:29	**Reserved**	RO